

FIRST SUPPLEMENT
TO THE
Pharmacopœia of the United States
Twelfth Revision

(First U. S. P. XII Supplement)

Because of the difficulties arising during the war period, the following changes in U. S. P. XII monographs are directed. These modifications are to remain in force until rescinded by official action.

Ergota, pages 166 and 167—Modify the "Storage" statement to read as follows:

Storage—Preserve Ergot under all conditions of storage and transportation in water-proof and air-tight containers, provided that temporarily and until rescinded no objection will be registered to the entry into the United States of Ergot not packed or stored in water-proof and in air-tight containers, even though containing more than 8 per cent of moisture, on the condition that it be dried, assayed, and repackaged immediately after entry so as to comply with all of the requirements above set forth.

Linimentum Saponis Mollis, page 257—Replace the 20 cc. of Oil of Lavender with 20 cc. of Oil of Cedar Leaf.

Spiritus Ammonii Aromaticus, page 424—Omit the 1 cc. of Oil of Lavender.

Syrupus Pruni Virginianæ, page 454—To conserve glycerin during the period of the War and until rescinded by official action, use the U. S. P. XI formula for Syrup of Wild Cherry instead of the new U. S. P. XII formula.

The U. S. P. XI details are as follows:

Mix 50 cc. of glycerin with 200 cc. of distilled water, moisten 150 Gm. of Wild Cherry bark in coarse powder, with 100 cc. of this mixture, pack it in a cylindrical percolator, and pour the remaining 150 cc. of menstruum upon it. When this has disappeared from the surface of the drug, add 200 cc. of distilled water to saturate the powder and leave a water stratum above it. Close the lower orifice, cover the percolator, and macerate the drug for 1 hour. Place 800 Gm. of sucrose in a bottle graduated to 1000 cc., and having a capacity of about 2000 cc., adjust it as the receiving bottle, and after the maceration allow the percolation to proceed rapidly.

When all of the liquid has passed through the drug, add 20 cc. of alcohol to the percolate, and then enough additional distilled water through the drug in the percolator to make the combined sucrose and percolate measure 1000 cc. Stopper the bottle and dissolve the sucrose by agitation without heat. Restore the volume by adding enough distilled water to make the product measure 1000 cc., and strain.

Syrup of Wild Cherry may also be prepared by the alternative U. S. P. XI process in which the sucrose is dissolved in a percolator.

Unguentum Aquæ Rosæ, page 534—The Expressed Oil of Almond may be replaced by an equal weight of Persic Oil.

The Oil of Rose may be omitted, and the Rose Water may be replaced by Distilled Water.

ERRATA

Make the following corrections in the U. S. P. XII text:

Carbo Activatus, page 118—In the “Heavy Metals” test add *1.0 cc. of standard lead solution* instead of the 0.1 cc. directed.

Gossypium Purificatum, page 207—Change the test for “Fiber Length” to read as follows:

Fiber Length—Determine the fiber length of Purified Cotton, as directed under *Fiber Length of Cotton*, page 581: not less than 60 per cent, by weight, of the fibers shall be 12.5 mm. (about $\frac{1}{2}$ inch) or greater in length and not more than 10 per cent, by weight, of the fibers shall be 6.25 mm. (about $\frac{1}{4}$ inch) or less in length.

Liquor Magnesii Citratis, page 271—Add the following “Note”:

Note—Dispense Solution of Magnesium Citrate in bottles containing not less than 340 cc. and not more than 360 cc., or in bottles containing not less than 195 cc. and not more than 205 cc.

Tabellæ Phenobarbitali, pages 478 and 479—Change the last sentence of the “Assay” to read: “Twice the weight of the residue represents the amount of phenobarbital in the portion of the Tablets taken for the assay.”

Tabellæ Phenobarbitali Sodici, pages 479 and 480—Change the last sentence in the “Assay” to read: “Twice the weight of phenobarbital so obtained, multiplied by 1.095, represents the weight of phenobarbital sodium in the portion of the Tablets taken for the assay.”

Totaquina, page 519—In the “Assay for quinine and cinchonidine” add *10 Gm. of powdered sodium tartrate* instead of the 30 Gm. directed.

By the authority of the U. S. P. Board of Trustees and of the Committee of Revision.

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Board of Trustees

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Official from November 1, 1942

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THE
PHARMACOPŒIA
OF THE
UNITED STATES OF AMERICA
(THE UNITED STATES PHARMACOPŒIA)

TWELFTH REVISION
(U. S. P. XII)

BY AUTHORITY OF THE
UNITED STATES PHARMACOPŒIAL CONVENTION
MEETING AT WASHINGTON, D. C., MAY 14 AND 15, 1940

PREPARED BY THE COMMITTEE OF REVISION AND
PUBLISHED BY THE BOARD OF TRUSTEES

OFFICIAL FROM NOVEMBER 1, 1942

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HISTORICAL INTRODUCTION.

to be held at Washington on the first of January, 1830, for the purpose of revising the American Pharmacopœia; and that these several institutions be requested to forward to the president, on or before the first day of April, 1829, the names of three persons thus designated by ballot; and the president of the Convention is hereby requested, on the said day, to assort and count the said votes, and to notify the three persons who shall have the greatest number of votes of their election; and in case there should not be three persons who have a greater number of votes than others, then the said president is desired to put a ballot into the box for each of those persons who have an equal number of votes, and draw therefrom such number of ballots as shall make the number of delegates three, and notify, as before.

This resolution to apply in like manner to the middle, southern and western districts.

In case neither of the delegates from a district can attend, it shall be the duty of such delegates to appoint a substitute who can attend.

Whereas the progressive improvements in medicine, as well as other causes, may render it expedient to revise the Pharmacopœia at an earlier period than is expressed above; it shall be the duty of the president to call the attention of the medical societies and colleges to the subject, whenever in his opinion the public good may require it.

PREFACE.

It is the object of a Pharmacopœia to select from among substances which possess medicinal powers, those, the utility of which is most fully established and best understood; and to form from them preparations and compositions, in which their powers may be exerted to the greatest advantage. It should likewise distinguish those articles by convenient and definite names, such as may prevent trouble or uncertainty in the intercourse of physicians and apothecaries.

The value of a Pharmacopœia depends upon the fidelity with which it conforms to the best state of medical knowledge of the day. Its usefulness depends upon the sanction it receives from the medical community and the public; and the extent to which it governs the language and practice of those for whose use it is intended.

In most European countries works of this kind have appeared under the authority of medical colleges and corporations. Their usefulness has generally been co-extensive with the influence of the bodies of men from whom they have originated. If they have been less useful than might have been hoped from their

simile of the "Preface" of the first Pharmacopœia of the United States, published in 1829 establishing the Scope policy of the U. S. Pharmacopœia

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PHARMACOPŒIAL SUBSTANCES, THEIR PREPARATIONS AND PRODUCTS, WITH ENGLISH AND SPANISH TITLES

A

English Title	Spanish Title
Acacia.....	Acacia (Goma Árábica)
Mucilage of Acacia.....	Mucílago de Goma Árábica
Acetanilid.....	Acetanilida
Acetone.....	Acetona
Acetophenetidin.....	Acetofenetidina
Acetophenetidin Tablets.....	Tabletas de Acetofenetidina
Acid, Acetic.....	Acido Acético (36 to 37 per cent)
Acid, Acetic, Glacial.....	Acido Acético Glacial
Acid, Acetylsalicylic.....	Acido Acetilsalicílico
Acetylsalicylic Acid Tablets.....	Tabletas de Acido Acetilsalicílico
Acid, Aminoacetic.....	Acido Aminoacético
Acid, Ascorbic.....	Acido Ascórbico
Ascorbic Acid Tablets.....	Tabletas de Acido Ascórbico
Acid, Benzoic.....	Acido Benzoico
Camphorated Tincture of Opium.....	Tintura de Opio Alcanforada
Acid, Boric.....	Acido Bórico
Glycerite of Boroglycerin.....	Glicerito de Boroglicerina
Boric Acid Ointment.....	Ungüento de Acido Bórico
Acid, Citric.....	Acido Cítrico
Syrup of Citric Acid.....	Jarabe de Acido Cítrico
Acid, Hydriodic, Diluted.....	Acido Yodhídrico Diluido
Syrup of Hydriodic Acid.....	Jarabe de Acido Yodhídrico
Acid, Hydrochloric.....	Acido Clorhídrico
Diluted Hydrochloric Acid.....	Acido Clorhídrico Diluido
Acid, Hypophosphorous.....	Acido Hipofosforoso (31%)
Acid, Lactic.....	Acido Láctico
Acid, Mandelic.....	Acido Mandélico
Acid, Nicotinic.....	Acido Nicotínico
Nicotinic Acid Tablets.....	Tabletas de Acido Nicotínico
Acid, Nitric.....	Acido Nítrico
Acid, Oleic.....	Acido Oleico
Acid, Phosphoric.....	Acido Fosfórico
Diluted Phosphoric Acid.....	Acido Fosfórico Diluido
Acid, Salicylic.....	Acido Salicílico
Acid, Stearic.....	Acido Estearico
Acid, Sulfuric.....	Acido Sulfúrico
Diluted Sulfuric Acid.....	Acido Sulfúrico Diluido
Acid, Tannic.....	Acido Tánico
Glycerite of Tannic Acid.....	Glicerito de Acido Tánico
Tannic Acid Ointment.....	Ungüento de Acido Tánico
Acid, Tartaric.....	Acido Tartárico
Acid, Trichloroacetic.....	Acido Tricloroacético
Agar.....	Agar
Alcohol.....	Alcohol
Dehydrated Alcohol.....	Alcohol Deshidratado
Diluted Alcohol.....	Alcohol Diluido
Allyl Isothiocyanate.....	Isotiocianato de Alilo
Aloe.....	Aloe
Aloin.....	Aloína
Althea.....	Altea

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THE HISTORY OF THE UNITED STATES PHARMACOPŒIA

IN January, 1817, Dr. Lyman Spalding,* of New York City, submitted to the Medical Society of the County of New York a project for the formation of a National Pharmacopœia.†

Doctor Spalding's plan was as follows: The United States was to be divided into four districts—Northern, Middle, Southern, and Western; the New England States to form the Northern District; New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia, the Middle District; and the States south and west of these borders to constitute the other two districts.

The plan provided that a Convention should be called in each of these districts, to be composed of delegates from all the medical societies and schools situated within each of them. Each District Convention was to form a Pharmacopœia, and appoint delegates to a General Convention, to be held in Washington, D. C. To this General Convention the four

*Born at Cornish, N. H., June 5, 1775; died at Portsmouth, N. H., October 30, 1821.

† While European Pharmacopœias were chiefly relied upon as authorities previous to the appearance of the first official Pharmacopœia of the United States of America, yet a few works had appeared, previous to this time, which deserve to be recorded here.

In 1778 there was published at Philadelphia a small Pharmacopœia for the use of the Military Hospital of the U. S. Army located at Lititz, Lancaster Co., Pennsylvania, under the title: "*Pharmacopœia simpliciorum et efficaciorum, in usum nosocomii militaris, ad exercitum fœderatarum Americæ civitatum pertinentis; hodiernæ nostræ inopiæ rerumque angustiis, feroci hostium sævitiae, belloque crudeli ex inopinato patriæ nostræ illato debitis, maxime accommodata.*" A second edition of this appeared in 1781, on the title page of which Dr. William Brown is mentioned as author.

On October 3, 1805, the Counsellors of the Massachusetts Medical Society appointed a Committee to draft a Pharmacopœia adapted to the special wants of their section of this country. The Committee, consisting of Dr. James Jackson and Dr. John C. Warren, endeavored to secure the co-operation of medical institutions in other States, with the object of making the work national, but without success. They presented the result of their labors to the Counsellors on June 5, 1807, and the work was issued some time in the early part of 1808. It was based upon the last preceding edition of the Edinburgh Pharmacopœia, but contained much original matter, among which was a posological and prosodial table.

In 1815 the Physicians and Surgeons of the New York Hospital appointed Dr. Samuel L. Mitchill and Dr. Valentine Seaman a Committee to prepare a Pharmacopœia for the use of that institution. This was issued in 1816, and enjoyed for some years an authority of more than local character.

District Pharmacopœias should be taken, and from the material thus brought together a National Pharmacopœia should be compiled. Doctor Spalding's plan was approved by the committee to which it was referred, and subsequently, through the agency of the Medical Society of the State of New York, it was carried into effect. This society issued circulars requesting the co-operation of the several incorporated State Medical Societies, the several incorporated Colleges of Physicians and Surgeons, or Medical Schools, or such medical bodies as constituted a faculty in any incorporated university or college in the United States; and in any State or Territory in which there was no incorporated medical society, college, or school, voluntary associations of physicians and surgeons were invited to assist in the undertaking.

The following organizations approved the plan of forming a National Pharmacopœia, and appointed delegates to district conventions: Massachusetts Medical Society, June 2, 1818; College of Physicians and Surgeons in the City of New York, June 25, 1818; Medical and Chirurgical Faculty of Maryland, June, 1818; Rhode Island Medical Society, September 1, 1818; Medical Society of South Carolina, September, 1818; Medical Society of the District of Columbia, October 5, 1818; Connecticut Medical Society, October 15, 1818; Medical Institution of Yale College, October 28, 1818; Vermont Medical Society, October, 1818; Board of Physicians and Surgeons of the First Medical District of the State of Indiana, November 3, 1818; College of Physicians and Surgeons of the Western District of the State of New York, January, 1819; College of Physicians of Philadelphia, February 2, 1819; Medical Faculty of Brown University, March 15, 1819; Medical School at Lexington, Kentucky, April, 1819; New Hampshire Medical Society, May 5, 1819; Medical Society of New Jersey, May 11, 1819; Medical Society of the State of Delaware, May, 1819; Medical Society of Georgia, May, 1819.

The Medical College of Ohio and the Medical Society of New Orleans approved the formation of a National Pharmacopœia, but they did not appoint delegates.

The District Convention for the New England States was held in Boston, June 1, 1819, and a District Pharmacopœia was adopted.

The District Convention of the Middle States was held in Philadelphia, June 1, 1819, and two outlines of Pharmacopœias, submitted by the delegates from New York and Philadelphia, were formed into one, which was adopted as the Pharmacopœia of the Middle District.

There were no conventions held in the Southern and Western Districts, but measures were taken, by those concerned, to secure a representation

of the Southern District in the General Convention at Washington. The General Convention for the formation of a National Pharmacopœia assembled in the Capitol, at Washington, January 1, 1820, and elected Samuel L. Mitchell, M.D., President, and Thomas T. Hewson, M.D., Secretary.

The two Pharmacopœias prepared in the Northern and Middle Districts were submitted to examination, compared in detail, and their contents, with such additions as were thought necessary, consolidated into one work, which, after full revision, was adopted by the General Convention, and ordered to be published by a committee appointed for that purpose, of which Dr. Lyman Spalding was chairman. It was published in Boston, December 15, 1820, in both the Latin and English languages, a second printing appearing in 1828.

FIRST REVISION

Before adjourning, the General Convention of 1820 made arrangements for the future revision of the work. It instructed its President to issue, on January 1, 1828, writs of election to the several incorporated State Medical Societies and incorporated Medical Colleges and Schools in the Northern District, requiring them to ballot for three delegates to a General Convention to be held at Washington on January 1, 1830, for the purpose of revising the American Pharmacopœia; and that these several institutions be requested to forward to the President, on or before April 1, 1829, the names of three persons thus designated by ballot.

The President of the Convention was requested, on the said day, to assort and count the said votes, and to notify the three persons, who should have the greatest number of votes, of their election. In case there should not be three persons who had a greater number of votes than others, then the said President was desired to put a ballot into the box for each of those persons who had an equal number of votes, and draw therefrom such number of ballots as should make the number of delegates three, and notify as before directed.

This resolution was to apply in like manner to the Middle, Southern, and Western Districts.

Accordingly, there were to be three delegates from each of the four districts, the Convention thus to consist of twelve delegates.

Notwithstanding the care thus exercised by the Convention of 1820 to arrange for a Convention in 1830, a serious misunderstanding occurred, the result of which was that two Pharmacopœias were published in 1830—one in New York and one in Philadelphia.

The President issued, on January 1, 1828, writs of election, as instructed by the Convention of 1820; but, on account of a certain ambiguity of expression in the resolution of the Convention of 1820, and perhaps, also, in the communication of President Mitchill addressed to the various societies and colleges, some of the organizations did not correctly understand what was expected of them, and instead of sending to President Mitchill the state of the ballot, forwarded to him merely its result. It appears to have been the impression in many places that the societies addressed were to choose delegates, and that the delegates thus chosen were to proceed to Washington.

President Mitchill received returns from the Northern and Middle Districts, but none from the Southern and Western Districts. He counted the ballots returned to him, as he understood that they should be counted, and notified the three delegates chosen by each of the two districts of their election, but the appointment of the delegates for the Middle District was not satisfactory to many of the medical societies of that region.

The delegates from the Northern and Middle Districts who had been notified by President Mitchill of their election resolved, by general concurrence, and for the sake of convenience, to hold the meeting of the Convention at New York instead of Washington, as directed by the authority under which they were chosen. Eli Ives, M.D., of Yale College, Connecticut, was elected President. As they were so few in number, they adjourned for six months in order to obtain assistance from the medical fraternity of the country. They issued a circular to each of the Medical Societies and Medical Institutions in the United States not represented in the Convention, requesting each to appoint a delegate to co-operate with this Convention in revising the American Pharmacopœia. Provided no delegate should be appointed, or, if appointed, should be unable to attend, said society or medical institution or delegates were requested to communicate their ideas, in relation to the revision of the Pharmacopœia, to the Convention at their next session to be held on the first Wednesday of June, 1830, at the College of Physicians and Surgeons of New York.

The Convention met, according to agreement, in New York, June 2, 1830, ten delegates being present, representing Connecticut, South Carolina, New York, Ohio, and Western Massachusetts. They revised the Pharmacopœia of 1820, authorized the publication of their revision, and, before adjourning, provided for a subsequent revision in 1835. The book was published in New York, November, 1830.

In consequence of the dissatisfaction existing in the Middle District, arrangements were made to hold a Convention at Washington, in January, 1830, which should be more fairly representative of the medical societies, colleges, and schools of the Middle District.

The Convention was held in the Capitol, at Washington, January 4, 1830. It consisted of eight delegates, two from New Jersey, two from Philadelphia, one from Delaware, one from Maryland, and two from the District of Columbia, all members from the Middle District. Lewis Condict, M.D., of New Jersey, was elected President.

Since many sections of the United States were not represented at this Convention, and it appeared desirable that the various medical interests of the country should have their due representation, it was resolved, soon after the organization of the Convention, that the Surgeon-General of the Army, the senior surgeon of the Navy, stationed at Washington, and those Members of Congress who were practitioners of medicine, should be invited to participate in the proceedings.

In compliance with this invitation, the Surgeon-General of the Army, the senior surgeon of the Navy, and three Members of Congress took their seats in the Convention, thus increasing the number of delegates to thirteen. The Convention appointed a Committee of Revision consisting of a Chairman and two members from each of the following cities, *viz.*: Boston, New York, Philadelphia, Baltimore, Washington, Charleston, Lexington, and Cincinnati.

The Chairman of the Committee was requested to open correspondence with the several members for the purpose of submitting to their examination a revised draft of the Pharmacopœia presented to the Convention by the delegates from Pennsylvania. He was also instructed to call a meeting of the Committee in Philadelphia. Any three members were constituted a quorum for the transaction of business, and, after a careful examination of the several communications that might be submitted to them, they were to prepare a revised edition of the Pharmacopœia, and make the necessary arrangements for its publication.

The Committee performed the duty imposed upon it, and its revision of the Pharmacopœia was published in Philadelphia in 1831.

SECOND REVISION

Previous to adjournment, the Washington Convention arranged for a Convention in 1840, by the following resolution: "*Resolved*, That the President of this Convention shall, on the first day of January, 1839, issue a notice, requesting the different incorporated State Medical

Societies, the incorporated Medical Colleges, and the incorporated Colleges of Physicians and Surgeons, throughout the United States, each to elect a number of delegates, not exceeding three, to attend a General Convention to be held at Washington, D. C., on the first Monday in January, 1840."

The plan of the New York Convention for a revision of the Pharmacopœia in 1835 was abandoned. The plan of the Washington Convention for a revision in 1840 was generally recognized as the more feasible and was fully carried out.

The notices for the choice of delegates to the Convention of 1840 were issued by Lewis Condict, M.D., President of the Washington Convention of 1830, in accordance with the resolution quoted above. The Convention assembled at Washington on the first day of January, 1840, twenty delegates being present, representing the Rhode Island Medical Society, the New Jersey Medical Society, the College of Physicians of Philadelphia, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the Delaware Medical Society, the Washington University of Baltimore, the Medical and Chirurgical Faculty of Maryland, the Medical Society of the District of Columbia, the Columbian Medical College, the Vincennes Medical Society of Indiana, and the Medical Society of Georgia.

The credentials of delegates from the Medical Society of Vermont, the Medical Society of New Hampshire, the Albany Medical College, and the College of Physicians and Surgeons of Lexington, Kentucky, were presented, but the delegates did not appear during the session. Lewis Condict, M.D., of New Jersey, was elected President.

With the view of giving the various medical interests of the country proper representation in the Convention, the Surgeon-General of the Army and the senior surgeon of the Navy, stationed at Washington, were invited to participate in the proceedings. The Convention appointed a Committee of Revision and Publication, consisting of seven members (three to form a quorum), and the meetings of the Committee were to be held at Philadelphia. To this Committee were referred all communications received by the Convention from the various organizations represented. The Committee was authorized to request the co-operation of the colleges of pharmacy in the United States, and to publish the work after the completion of the revision. Valuable assistance was rendered the Committee by the Colleges of Pharmacy of Boston and New York; the Philadelphia College of Pharmacy presented a complete revised copy of the Pharmacopœia, elaborated with ability and great

industry. The Committee accepted, after deliberate examination, nearly all of the suggestions, and this caused delay in the issue of the work. The book was not published until early in the year 1842. In this revision the Latin version was omitted. The process of displacement or percolation was introduced for the first time.

THIRD REVISION

Before adjourning, provision was made, by the following resolution, for a Convention in 1850:

"The President of this Convention shall, on the first day of May, 1849, issue a notice, requesting the several incorporated State Medical Societies, the incorporated Medical Colleges, the incorporated Colleges of Physicians and Surgeons, and the incorporated Colleges of Pharmacy, throughout the United States, each to elect a number of delegates, not exceeding three, to attend a General Convention to be held at Washington, on the first Monday in May, 1850."

In accordance with this resolution, the Convention met at Washington, May 6, 1850, thirty delegates being present, representing: the Rhode Island Medical Society, the Geneva Medical College, the College of Pharmacy of the City of New York, the Medical Society of New Jersey, the College of Physicians of Philadelphia, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the Medical Faculty of the Pennsylvania College, the Medico-Chirurgical College of Philadelphia, the Philadelphia College of Pharmacy, the Medical Society of Delaware, the Medical and Chirurgical Faculty of Maryland, the Medical Society of the District of Columbia, the National Medical College of the District of Columbia, the Medical Department of the National Institute, the Georgetown Medical College, and the Rush Medical College of Chicago.

The credentials of delegates from the New Hampshire Medical Institution, the University of Buffalo, the Medical Department of Hampden-Sidney College, the Medical Society of South Carolina, the Medical College of Ohio, the Cincinnati College of Pharmacy, the Missouri Medical Society, the Wisconsin State Medical Society, and the Medical Faculty of the University of Iowa were presented, but the delegates did not appear during the session.

George B. Wood, M.D., of Philadelphia, was chosen President. The Surgeon-General of the Army and the Chief of the Bureau of Medicine and Surgery of the Navy Department were invited to participate in the proceedings.

The Convention appointed a Committee of Revision and Publication, consisting of the President of the Convention and three other members, three to form a quorum; the meetings of the Committee were held in Philadelphia, and the Committee published the revised work in 1851. A second edition was issued in 1855.

FOURTH REVISION

Before adjourning, the Convention of 1850 made arrangements for a Convention to be held on the first Wednesday in May, 1860, by a resolution similar to the one adopted by the Convention of 1840.

The Convention met in 1860, thirty delegates being present, representing: the Maine Medical Association, the Massachusetts Medical Society, the Massachusetts College of Pharmacy, the Connecticut State Medical Society, the Medical Society of the State of New York, the New York Academy of Medicine, the College of Pharmacy of the City of New York, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the College of Physicians of Philadelphia, the Philadelphia College of Pharmacy, the Delaware State Medical Society, the University of Maryland, the Maryland College of Pharmacy, the National Medical College of Washington, the Medical Society of the District of Columbia, the United States Army, and the United States Navy. George B. Wood, M.D., of Philadelphia, was chosen President.

A Committee of Revision and Publication was appointed, consisting of nine members, including the President of the Convention. To this Committee were referred all communications relating to the revision of the Pharmacopœia. Three members were to form a quorum. The Committee was to meet in Philadelphia, and was authorized to publish the work after its revision. The book was published in June, 1863. Before adjourning, the Convention made arrangements, by a resolution similar to that adopted by the Convention of 1850, for a Convention in 1870.

FIFTH REVISION

In accordance with this resolution, a Convention met in Washington, Wednesday, May 4, 1870, sixty delegates being present, representing: the St. Louis Medical College, the Maryland College of Pharmacy, the Missouri Medical College, the St. Louis College of Pharmacy, the Chicago College of Pharmacy, the Medical Society of the District of Columbia, the Medical College of Virginia, the Massachusetts College of Pharmacy, the Medical Society of the State of New York, the College

of Physicians of Philadelphia, the College of Pharmacy of the City of New York, the National Medical College of Washington, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the Philadelphia College of Pharmacy, the College of Pharmacy of Baldwin University, the Medico-Chirurgical Society of Louisville, the Baltimore Medical Association, the Medical Department of Georgetown College, the Washington University of Baltimore, the Massachusetts Medical Society, the Maine Medical Association, the University of Buffalo, the Medical and Chirurgical Society of Maryland, the Baltimore Medical Association, the University of Nashville, the University of Maryland, the Pharmaceutical College of Howard University, the University of Virginia, and the Woman's Medical College of Philadelphia.

Such Members of Congress as were graduates of regular medical schools, the Surgeon-General of the Army, and the Chief of the Bureau of Medicine and Surgery of the Navy Department were invited to take seats in the Convention and participate in its deliberations. Joseph Carson, M.D., of Philadelphia, was elected President of the Convention.

A Committee of Revision and Publication, consisting of fifteen members, was appointed and given definite instructions as to the general plan to be followed in revising the Pharmacopœia.

A resolution was adopted directing "that measures of capacity be abandoned in the Pharmacopœia, and that the quantities in all formulas be expressed in weights and in parts by weight." The Committee of Revision, by a unanimous vote, decided that the adoption of the principle of parts by weight was impracticable, and definite weights and measures were used in the Pharmacopœia.

Before adjourning, it was resolved that the rules adopted by the Convention of 1860, for the meeting of 1870, be adopted for the Convention of 1880, simply changing the dates.

The Fifth Revision of the Pharmacopœia was published in 1873.

SIXTH REVISION

The next Convention assembled on May 5, 1880, at Washington. There were one hundred and nine delegates accredited from ten Medical Societies, twenty-three Medical Colleges, eleven Pharmaceutical Colleges, and the Medical Departments of the Army, the Navy, and the Marine Hospital Service. Seventy-five delegates attended the meeting. Dr. Robert Amory, of Boston, was elected President of the Convention.

Important changes were directed at this meeting to be made in the Pharmacopœia, the more prominent ones being the following: all articles

were to be arranged in alphabetical order; a new chemical nomenclature was to be introduced; quantities were to be stated in "parts by weight," and descriptions of crude drugs and of chemicals were to be made more comprehensive and exact. Numerous tables were also directed to be added to the work. A Committee of Revision was elected, consisting of twenty-five members, and its powers and duties were expressly defined.

Regarding the call to be issued for the Convention of 1890, it was resolved that the President of the Convention of 1880 should, on or about the first day of May, 1889, issue a notice requesting the several incorporated Medical Societies, the incorporated Medical Colleges, the incorporated Colleges of Pharmacy, the incorporated Pharmaceutical Societies throughout the United States, the American Medical Association, and the American Pharmaceutical Association, each to elect a number of delegates, not exceeding three; the Surgeon-General of the Army, the Surgeon-General of the Navy, and the Surgeon-General of the Marine Hospital Service, each to appoint not exceeding three medical officers to attend a General Convention for the Revision of the Pharmacopœia of the United States, to be held in Washington, D. C., on the first Wednesday of May, 1890.

It was also resolved that the several bodies, as well as the Medical Departments of the Army, the Navy, and the Marine Hospital Service, thus addressed, should also be requested by the President to submit the Pharmacopœia to a careful revision and to transmit the result of their labors, through their delegates, to the Committee of Revision, at least three months before the meeting of the Convention.

The several medical and pharmaceutical bodies were further to be requested to transmit to the President of the Convention of 1880 the names and residences of their respective delegates, as soon as they had been appointed; a list of whom was to be published, under his authority, for the information of the medical public, in the newspapers and medical journals, in the month of March, 1890.

Finally, it was resolved that in the event of the death, resignation, or inability of the President of the Convention to act, these duties should devolve successively, in the following order of precedence: upon the Vice-Presidents, the Secretary, the Assistant Secretary, and the Chairman of the Committee of Revision and Publication of the Pharmacopœia.

The Sixth Revision of the Pharmacopœia was published at the close of October, 1882.

SEVENTH REVISION

In accordance with the instructions of the Convention of 1880, the Convention for the Seventh Decennial Revision of the Pharmacopœia of the United States of America met on May 7, 1890, in the City of Washington, one hundred and seventy-five delegates being present, representing: the Medical Departments of the United States Army, the United States Navy, the United States Marine Hospital Service, and fifteen Medical Societies or Associations, twenty-three Medical Colleges and Universities, twenty-five Pharmaceutical Associations, and twenty-three Colleges of Pharmacy and Universities.

Dr. Horatio C. Wood, of Philadelphia, was elected President.

It was recommended by the Convention that assay processes should be appended to the United States Pharmacopœial descriptions of the energetic or otherwise important drugs, and to such galenical preparations as the Committee of Revision of the Pharmacopœia should deem wise, especial care being taken that the assay processes for opium and cinchona should be attended with as little manipulative difficulty as possible; that the standard of purity for drugs should not be above the point of practicability; that the strength of official tinctures and wines should be ten per cent as far as advisable in the judgment of the Committee; that no substances protected by proprietary rights, or produced solely under a patented process, should be introduced into the Pharmacopœia.

In regard to weights and measures, the principle of parts by weight was abandoned, and the Committee of Revision was instructed to direct solids to be weighed and liquids to be measured, except in those cases in which the Committee should find it advisable to use weights only; also, that the metric system should be employed.

The Committee of Revision, consisting of twenty-six members, who were elected by the Convention, proceeded to revise the Pharmacopœia in accordance with their instructions.

Before its adjournment, the Convention for the Revision of the United States Pharmacopœia directed that the President of this Convention "shall, on or about the first day of May, 1899, issue a notice requesting the several bodies represented in the Conventions of 1880 and 1890, and also such other incorporated State Medical and Pharmaceutical Associations, and incorporated Colleges of Medicine and Pharmacy, as shall have been in continuous operation for at least five years immediately preceding, to elect a number of delegates, not exceeding three, and the Surgeon-General of the Army, the Surgeon-General of the Navy, and

the Surgeon-General of the Marine Hospital Service, each to appoint not exceeding three medical officers, to attend a General Convention for the Revision of the Pharmacopœia of the United States, to be held in Washington, D. C., on the first Wednesday of May, 1900."

The Seventh Revision of the United States Pharmacopœia was published in September, 1893, and became official January 1, 1894.

EIGHTH REVISION

The Eighth Decennial Convention for revising the Pharmacopœia met in Washington, D. C., May 2, 1900, the President, Horatio C. Wood, presiding. Delegates were present, representing twenty-eight states, the District of Columbia, and the Army, Navy, and Marine Hospital Service. Following the address of the President, a report from the Chairman of the Committee of Revision, Joseph P. Remington, the adoption of "General Principles," and other routine business, a Board of Trustees and a Committee of Revision of twenty-five members were elected, the President of the Convention being a member *ex-officio*.

The eighth revision differed from previous revisions in the fact that the business management was entrusted to a Board of Trustees and the Committee of Revision was thus afforded more time to devote to the immediate duties of revision. On July 7, 1900, a Charter with articles of incorporation was issued by the District of Columbia to the United States Pharmacopœial Convention, with a view of giving greater stability to the organization (see page xxxvi).

By far the most important occurrence in connection with the Pharmacopœia was the passage of an Act by the Congress of the United States, entitled the Food and Drugs Act, June 30, 1906. The standards adopted under this Act were those of the United States Pharmacopœia and the National Formulary. Up to the time of the passage of this Act the standards of the United States Pharmacopœia were not compulsory, except in a very few instances. Some of the State Legislatures followed the action of the Federal Government and passed laws of similar import. The passage of this legislation *compelled* official preparations to be made in accordance with the requirements of the standards of the United States Pharmacopœia, and a far greater interest was taken in these standards in all parts of the country.

In September, 1902, there was held in the City of Brussels an important conference, entitled "Conférence Internationale pour l'Unification de la Formule des Médicaments Héroïques," which was composed of delegates from nearly every civilized country. The purpose of this body

was to endeavor to formulate standards for *potent remedies* which would be adopted by the various pharmacopœias of the world, and thus there would be secured the principal object of an international pharmacopœia. The recommendations of this conference were adopted by the Committee of Revision, except in one or two instances. This made necessary a number of changes in the strength of important official preparations.

The Purity Rubric was first established in the Eighth Revision, the object being explained as follows: "The necessity for more accurately defining the limit of purity permissible in official chemical substances has been apparent for many years. In the Sixth Decennial Revision this question was met by inserting more definite descriptions with qualitative and quantitative tests. In the Seventh Revision will be found a still greater elaboration of this plan. In the present revision there has been added what has come to be known as the purity standard, or purity 'rubric,' which is placed in large type immediately before the description, and which defines the percentage of small quantities of permissible, innocuous impurities which do not materially affect medicinal action or interfere with pharmaceutical uses. It is believed that this plan will enable the reader to ascertain at a glance the standard which has been adopted, and which represents what the Committee believes to be obtainable, and which, on the other hand, will not prove burdensome or impossible for the manufacturer to produce without adding unnecessary and excessive cost to the consumer."

An advance was made in the Eighth Revision by increasing the number of proximate assays and the processes were made more efficient. Serum products were introduced because of their growing importance.

The long continued custom of designating United States Pharmacopœias by the decennial periods of their revision was dropped, and they were designated by the number of revisions; instead of U. S. P. 1900, which was not issued until 1905, it was called simply the "Eighth Decennial Revision."

Average doses which were not intended to be compulsory, but which were to act as a guide in the administration of medicines, were appended under medicinal articles.

The Eighth Revision became official from September 1, 1905, but some additions and corrections were necessary on account of the passage of the Food and Drugs Act.

General tests for heavy metals and arsenic which would apply to many chemical substances throughout the text were inserted under the head of "General Tests" in the Appendix.

A Digest of Comments was authorized in this revision and the work was done under the supervision of the Public Health and Marine Hospital Service.

A Spanish translation of the Eighth Revision of the United States Pharmacopœia, prepared in 1909, was received with much satisfaction in the Spanish-speaking countries of the Americas.

NINTH REVISION

The members of the U. S. Pharmacopœial Convention of 1910 consisted of the four incorporators who were living, the officers of the Convention of 1900, the Board of Trustees, the Committee of Revision of 1900-1910, and two hundred and eighty registered delegates from thirty-eight states, eighteen from seven national organizations, and twelve delegates from the Government, representing the Surgeon-General's office, United States War Department; Bureau of Medicine and Surgery, United States Navy Department; Bureau of Public Health and Marine Hospital Service, United States Treasury Department; and the United States Department of Agriculture.

Owing to the illness of Dr. Horatio C. Wood, President of the United States Pharmacopœial Convention, and the death of Albert B. Prescott, First Vice-President of the organization, Dr. Otto A. Wall, the Second Vice-President, presided over the Ninth Decennial Convention which assembled in Washington, D. C., May 10, 1910.

The Eighth Revision had been adopted as a standard under the Food and Drugs Act of June 30, 1906; this, and recognition in other national and State Legislation, enlarged the scope of the Pharmacopœia and gave even greater significance to the Ninth Revision. The former revision became a legal standard after its publication. In the Ninth Revision this obligation placed further responsibilities upon the members of the Convention and the Committee of Revision.

The procedure of the Eighth Revision was closely followed in that of the Ninth Revision—the responsibilities of business management devolved on the Board of Trustees, and the Committee of Revision devoted its activities to the immediate duties of revision.

The membership of the Committee of Revision was increased to fifty-one, the President of the Convention being an ex-officio member. Fifteen sub-committees were named, of which the chairmen, elected by the members of the respective sub-committees, constituted an executive committee, whereby the work of revision was expedited.

The General Principles to guide the Committee of Revision, adopted

at the 1910 United States Pharmacopœial Convention, were very similar to those of the preceding Revision, except that lists of preparations were to be appended to Official Drugs and Chemicals, and alcoholic percentages to the preparations containing alcohol. Permission was also given to include additional serums and biological products if standardized by a Department of the Government.

The atomic weight basis was changed from hydrogen taken at 1 to oxygen taken at 16.

The metric system of weights and measures was retained, but the term "cubic centimeter" was replaced by "mil," a word formed from the the first three letters of the term "milliliter." The term "mil" had been adopted by the British Pharmacopœia, and the U. S. Bureau of Standards pointed out that the cubic centimeter did not correspond exactly with a thousandth part of a liter.

The doses of the Ninth Revision were given in both the metric and apothecaries' systems, but these were not to be considered as equivalents, nor were the amounts to be regarded as obligatory on the physician.

Optional bio-assay methods were introduced for digitalis, squill, strophanthus, aconite, and suprarenal glands, and a biological method of assay was made a requirement for cannabis and its preparations, and for the solution of hypophysis.

Official methods were introduced for the determination of ash, of crude fiber, volatile and non-volatile extractive, melting points, boiling points, and congealing points, and also specifications for standard thermometers. Electrolytic determinations were included for mercury and zinc and their salts.

A chapter on Sterilization, as employed in the practice of medicine and pharmacy, was added, and another on Diagnostic Reagents and Clinical Tests.

In addition to other pharmacognostic descriptions, the microscopic characteristics of powdered drugs were given, and the purity rubric was extended to the organic drugs, giving the percentage of allowable admixtures of non-official parts of the drug plants and other foreign matter.

The principles of the International Protocol were adhered to in the Ninth Revision, but some changes were necessary and others desirable. Bitter almond water is used in this country largely as a vehicle and this makes the adoption of the requirement of 0.1 per cent of hydrocyanic acid inadvisable; a change in the strength of syrup of ipecac would not meet with favor by American physicians and pharmacists, nor would the stronger tincture of iodine of the Protocol be acceptable. The difference

in manufacturing methods in this country and European countries presents further reasons for not fully complying with the International Protocol.

The publication of the abstracts of proposed changes with new standards and descriptions during the revision period met with general approval and attracted the attention of the members of revision committees and others in Europe. Through this medium the Committee secured aid in the work of revision, the value of the standard was enhanced and, thereby, advance information was given to those who make daily use of the Pharmacopœia.

Expressions of appreciation in resolutions, not only in the Pharmacopœial Convention but by other organizations interested in pharmacopœial revision, emphasized the value of the "Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary," which again served a most useful purpose as an aid in the revision and as a guide for the avoidance of unnecessary duplication of observation and of original work already recorded.

The Ninth Decennial Revision of the Pharmacopœia of the United States of America became official September 1, 1916. The Spanish edition, as of the preceding Revision, was received with growing satisfaction in the Spanish-speaking countries of the Americas. A Chinese translation was also published and met with favor in China and in this country by those who have business dealings in China.

The program of the Ninth Decennial Convention for the Revision of the Pharmacopœia evidenced that a number of revision workers had ceased their labors, and seldom has the toll of death been as great as during the period of revision and following the completion of the U. S. P. IX. The list included the distinguished names of Dr. Horatio C. Wood, President of the Convention; Dr. Otto A. Wall, who presided over its sessions; Charles Caspari, Jr., Second Vice-President; Leo Eliel, Fourth Vice-President; Joseph P. Remington, Chairman of the Committee of Revision; and C. Lewis Diehl, First Vice-Chairman.

Following the death of Chairman Remington in 1918, the First Vice-Chairman, C. Lewis Diehl, having died some time previously, the Second Vice-Chairman, Dr. Horatio C. Wood, Jr., called for an election for Chairman of the General Committee of Revision, and on April 6, 1918, Charles H. LaWall was elected to fill the vacancy for the remainder of the decade.

A number of other deaths having occurred during the decennial period, the vacancies were filled by an election held early in the summer

of 1918 when the following were added to the Committee of Revision: E. Fullerton Cook, W. B. Day, S. L. Hilton, H. P. Hynson, J. K. Lilly, Dr. L. G. Rowntree, L. A. Seltzer, and W. J. Teeters.

E. Fullerton Cook was elected Secretary to the General Committee to fill the place made vacant by the election of Secretary LaWall to the Chairmanship.

Vacancies having occurred in the Executive Committee by death and other causes, the following chairmen were elected during 1918 for the following Sub-committees: Inorganic Chemistry, H. V. Army; Aromatic Waters, Spirits and Liquors, E. G. Eberle; Syrups and Elixirs, J. W. England; Nomenclature, Dr. H. H. Rusby. The remainder of the decade was devoted to the study of problems arising from the War and subsequent shortage of supplies and by preliminary investigations leading to the new revision to be undertaken in 1920.

TENTH REVISION

The U. S. Pharmacopœial Convention of 1920 met at the New Willard Hotel on May 11, 1920, with the President, Harvey W. Wiley, presiding. The members of the Convention were composed of two of the incorporators, the officers of the Convention of 1910, the members of the Board of Trustees and of the Committee of Revision of 1910-1920, eleven governmental delegates representing the medical departments of the Army and the Navy, the United States Public Health Service, the United States Department of Agriculture and the U. S. Treasury, Customs Service; also twenty-two delegates from nine national associations and additional delegates from thirty-five States, making a total of two hundred and eighty-six registered delegates.

Following the election of the officers of the Convention, the Board of Trustees and the Revision Committee, various individuals and organizations submitted recommendations for the new revision.

At the close of the Convention the Board of Trustees and Committee of Revision met and organized for the work of the decade.

The general policies and methods of procedure for the Tenth Revision were similar to those of the Eighth and Ninth Revisions. Most of the work of revision was conducted by correspondence but three meetings of the General Committee, including Sub-committee conferences, were held. These made possible the prompt settlement of many questions and shortened the time needed to complete the revision.

The General Committee was divided into fifteen Sub-committees, the Chairman of these Sub-committees being elected to membership

on an Executive Committee. The policy of the revision was to place in the Circulars of the main Committee the discussion on all general questions as well as Sub-committee reports and comments, but to refer to the Sub-committees for decisions upon all questions of detail involving special technical knowledge.

In the first conference of the General Committee, immediately following the Convention, the Sub-committee on Scope was organized. Its membership was made up of sixteen physicians and five pharmacists. They were given the responsibility for proposing the admission to the U. S. P. X of therapeutically active substances and those which were pharmaceutical necessities. A "Referee Committee on Scope," consisting of the twenty-one physicians on the General Committee, was given the final responsibility for deciding disputed questions involving the admission of substances of therapeutic value.

A new feature of the decade was the election of auxiliary members to Sub-committees for the purpose of securing the help of many experts in the work of revision. These auxiliary members received the official Sub-committee Bulletins and were invited to discuss in the Bulletins all questions before the Sub-committee with which they were associated. These members, however, did not vote or attend conferences.

The former division of the Pharmacopœia into "Part I" and "Part II" was abandoned, each section being designated by an appropriate title. This placed all sections of the book upon the same status and avoided any question of the legality of special parts.

The standards of the Pharmacopœia were again made to agree as closely as was practicable with the International Standards adopted by the Brussels Conference of 1902.

The Revision Committee endeavored to conform to the recommendations of the 1920 Convention as set forth in the "General Principles" which had been adopted by the Convention. These were printed in full in the Pharmacopœia and covered such points as the scope limitations and scope policies, the adoption of an "average dose," guides for nomenclature, the basis for the purity and strength policy, the retention of the metric system of weights and measures and the standard temperature of 25° C., the publicity policy, the authorization for supplements and other general guides for the revision.

Following the publication of the U. S. P. X two deaths occurred in the Committee of Revision and these vacancies were filled by the election of J. Leon Lascoff, of New York, N. Y., and John Phillips, M.D., of Cleveland, Ohio.

During the closing years of the decade the Executive Committee planned and directed a number of scientific researches on unsolved questions associated with the revision and placed these on record as an aid to the next Committee of Revision.

The Trustees proposed the establishment of "The Remington Research Fund," and this recommendation was approved by the U. S. P. Convention of 1930.

The Tenth Revision of the Pharmacopœia of the United States became official on January 1, 1926. The Spanish edition of the Pharmacopœia was translated by a Committee of the University of Havana and was again made official in Cuba and has been widely distributed through the Republics of Central and South America.

During the active period of revision a special conference on vitamins was called (1924) and this pioneer group developed the first official vitamin A assay. That there was an anti-rachitic factor was then known, but it had not yet been named vitamin D. With the subsequent extensive and rapid development in the knowledge of vitamins it became necessary to revise these vitamin standards and assay methods, and a modified cod liver oil monograph with new assays was issued in 1934 in accordance with the new U. S. P. policy of "Interim Revision Announcements." Scientific development in other fields made additional revisions desirable and four of these "Announcements" or supplements were issued.

ELEVENTH REVISION

The Convention for the Eleventh Revision of the United States Pharmacopœia was called to order at the New Willard Hotel on May 13, 1930, by the President, Dr. Reid Hunt.

The membership of the Convention included one of the incorporators, the officers of the Convention of 1920, the members of the Board of Trustees and the members of the Committee of Revision of 1920-1930, and governmental delegates, representing the Medical Departments of the Army and Navy, the United States Public Health Service, the United States Department of Agriculture, and the United States Department of Commerce. There were also delegates from ten national associations and additional delegates from medical and pharmaceutical associations and colleges representing forty-five States and Territories, Cuba, and the Philippines, making a total of over four hundred registered delegates.

Amendments to the Constitution and By-Laws of the Convention as recommended by the Board of Trustees, were approved.

Following a discussion on the responsibility of Sub-committees, especially with reference to the decisions on scope, the following resolution was approved by the Convention:

"Resolved, That all reports of all Sub-committees of the Committee of Revision shall be printed in bulletin form and shall be submitted to each member of the Committee of Revision. If no objection is raised the report of the Sub-committee will obtain. If objections are raised, the report shall be submitted to a vote of the entire Committee of Revision and the report can be rejected only when a vote of at least two-thirds of the entire Committee of Revision is registered against the report."

Officers of the Convention, members of the Board of Trustees, and members of the Committee of Revision were duly elected. Among these were persons who came from twenty-seven States, representing thirty-two colleges or universities. In addition to the regular members of the Revision Committee and Board of Trustees there were more than two hundred physicians, pharmacists, and experts in related sciences who assisted in the revision work during the decade. This comprehensive group thus provided nation-wide co-operation in Pharmacopœial work.

The Convention considered and adopted the "General Principles" to serve as a guide for the Revision Committee. These "General Principles" which did not vary materially from those of the preceding decade will be found in detail in the U. S. P. XI, pages lxiii to lxvi.

Various organizations presented communications dealing with revision policies, suggesting changes in the Pharmacopœia and proposing additions and deletions. All of these were referred to the Committee of Revision or Board of Trustees for appropriate action.

The organization of the Committee of Revision and of the Board of Trustees immediately followed the close of the Convention.

The question of scope, so far as it involved therapeutically active substances, was again left largely to the physician members of the Committee, while those substances required for the making of preparations and therefore "pharmaceutic necessities," were admitted automatically when recommended by the pharmaceutical members.

The Sub-committee on Scope, composed of eighteen physicians and five pharmacists, continuously kept before it the traditional policy of the Pharmacopœia, namely, to select for admission those substances and their preparations which the physicians believed to be of outstanding importance in modern medical practice.

After organization, the General Committee and the fifteen Subcommittees held two general conferences and the smaller groups had frequent meetings. The major work of revision, as before, was conducted by means of official Circulars and Bulletins carrying reports, discussions, and votes, and by an extensive personal correspondence. Because of the necessity of dealing with certain highly technical problems, four Advisory Boards composed of individuals especially qualified in the subjects covered were created. These Boards dealt with the control and standardization of vitamins, anti-anemia products, hormones, and sterile and other surgical products. The recommendations of these Boards were approved by the General Committee of Revision before they became a part of the official text.

The new Pharmacopœia became official on June 1, 1936, but the rapidity of scientific and medical advances was such that it was found desirable to issue two Supplements, which became official on December 1, 1937, and January 1, 1940, respectively. By this means the Pharmacopœia endeavored to maintain its scope and standards in harmony with current developments in medicine, pharmacy, and the related sciences.

The revised Federal Food, Drug and Cosmetic Act, passed in 1938, again recognized the United States Pharmacopœia as an official compendium, and the new provisions of this act greatly increased the responsibilities of the Revision Committee. To meet these new demands upon the Pharmacopœia, it was proposed that two revisions of the Pharmacopœia be published during the next decade, and also Interim Revision Announcements or Supplements covering new items or revised standards, whenever, in the opinion of the Committee of Revision and the Board of Trustees, these are believed to be necessary. This program is made possible by the adoption of the plan of "continuous revision."

During the decade the Committee of Revision sponsored two series, of twenty-four articles each, for the purpose of extending Pharmacopœial information to physicians and pharmacists. These articles originally appeared in the Journal of the American Medical Association. The First Series has also been published in book form in both English and Spanish and has been widely distributed. A similar plan is proposed for the Second Series.

The Board of Trustees again published a Spanish edition of the new Pharmacopœia. They had the good fortune to receive aid from the Pan American Sanitary Bureau in Washington both in preparing the trans-

lation and in bringing the Spanish edition to the attention of all Central and South American countries.

A new feature of the revision period was the preparation and distribution of reference standards to be used for comparison in biological assays. Such standards were provided for Vitamin A; Vitamin D; Vitamin B₁ (Thiamine Hydrochloride); Vitamin C (Ascorbic Acid); Ergot; Digitalis; Epinephrine; Ouabain; Pepsin; Posterior Pituitary; Estrone; Aconite; and Trypsin. In addition, the Pharmacopœia assumed the responsibility for distributing International standards for biological products for the League of Nations.

ARTICLES OF INCORPORATION

IN accordance with the instructions of the United States Pharmacopœial Convention of May, 1900, the Board of Trustees directed its Chairman, Mr. W. S. Thompson, of Washington, D. C., to employ an attorney who should take out articles of incorporation for the Convention under the laws of the District of Columbia.

The first difficulty encountered was in the fact that the laws aforesaid require that a majority of the Incorporators be residents of the District of Columbia. This made it, at least, impracticable to include among these Incorporators the Officers and Committee of Revision elected by the Convention. It was then determined to ask the Committee on Credentials and Arrangements to officiate in this capacity, and the Treasurer, Dr. W. M. Mew, took the place of Dr. J. E. Brackett, because of the latter's absence from the country.

These preliminaries having been arranged, the following certificate of incorporation was drawn up, signed, and recorded, finally, on the eleventh day of July, 1900:

CERTIFICATE OF INCORPORATION

This is to certify that we, whose names are hereunto subscribed, citizens of the United States, of full age, and a majority citizens of the District of Columbia, do associate ourselves together pursuant to the provisions of sections 545-552 inclusive of the Revised Statutes of the United States relating to the District of Columbia and of the Act of Congress to amend the same, approved the twenty-third day of April, 1884, under the corporate name of The United States Pharmacopœial Convention.

This Association is organized for a period of nine hundred and ninety-nine years.

The particular objects and business of this Association are the encouragement and promotion of the science and art of medicine and pharmacy by selecting by research and experiment and other proper methods and by naming such materials as may be properly used as medicines and drugs with formulas for their preparation; by establishing one uniform standard and guide for the use of those engaged in the practice of medicine and pharmacy in the United States whereby the identity, strength, and purity of all such medicines and drugs may be accurately determined, and for other like and similar purposes; and by printing and distributing at suitable intervals such formulas and the results of such and similar selections, names and determinations among the members of this Association, pharmacists, and physicians generally in the United States and others interested in pharmacy and medicine.

The management and control of the affairs, funds, and property of this Association for the first year of its existence shall be vested in a Board of Trustees consisting of the seven following persons:*

ALBERT E. EBERT.
SAMUEL A. D. SHEPPARD.
WILLIAM S. THOMPSON.
CHARLES E. DOHME.
GEORGE W. SLOAN.
HORATIO C. WOOD.
CHARLES RICE.

In testimony whereof we have hereunto set our hands and affixed our seals this seventh day of July, 1900.

WILLIAM S. THOMPSON.	[SEAL]
G. LLOYD MAGRUDER.	[SEAL]
JOHN T. WINTER.	[SEAL]
THOMAS C. SMITH.	[SEAL]
MURRAY G. MOTTER.	[SEAL]
WILLIAM M. MEW.	[SEAL]
FRANK M. CRISWELL.	[SEAL]

* The laws of the District of Columbia with regard to corporations require that the Board of Trustees, or Directors, for the first year shall be named in the Certificate of Incorporation.

CONSTITUTION AND BY-LAWS OF THE UNITED STATES PHARMACOPŒIAL CONVENTION, INC.

AS REVISED BY THE CONVENTION OF 1940

The Constitution and By-Laws of the United States Pharmacopœial Convention, Inc., as revised by the Convention of 1940, has been published in the Abstract of Proceedings of the Convention and may be obtained on application, to Lewis E. Warren, Secretary of the Convention, 2 Raymond Street, Chevy Chase, Md.

The 1940 Convention authorized the appointment of a special Committee to revise the Constitution and By-Laws and to report this to the members of the Convention within two years for their consideration.

This adjourned meeting of the Convention was held in Cleveland, Ohio, on April 7, 1942, at which time numerous changes were made in the By-Laws. As required by the present Constitution, changes in the Constitution will be voted upon at the regular decennial meeting in 1950.

Because of these changes, no Constitution and By-Laws are included in this Pharmacopœia.

ABSTRACT OF THE PROCEEDINGS OF THE U. S. PHARMACOPŒIAL CONVENTION OF 1940

THE thirteenth meeting of the United States Pharmacopœial Convention was held at the Willard Hotel, Washington, D. C., May 14, 1940. The Convention was called to order by the President, Dr. Walter A. Bastedo, and the roll of the members of the Convention was read by the Secretary, L. E. Warren.

The President introduced the delegates from Cuba, Puerto Rico, and the Philippines, then called Vice-President H. A. B. Dunning to the chair, and delivered his address.

After the President's address, reviews of Pharmacopœial affiliations were presented on the following subjects:

The Relation of the Pharmacopœia to the Medical Profession, by Dr. Morris Fishbein, Editor of the A. M. A. Journal.

The Relation of the Pharmacopœia to the Pharmaceutical Profession, by Dr. E. F. Kelly, Secretary of the A. Ph. A.

The Relation of the Pharmacopœia to the Food and Drug Administration, by Walter G. Campbell, Commissioner of Food and Drugs, Food and Drug Administration, Federal Security Agency, Washington, D. C.

Reports were then presented by the Chairman of the Board of Trustees, James H. Beal. In Chairman Beal's report were several amendments to the Constitution and By-Laws drafted (adopted) and announced by the Board of Trustees. Consideration of these amendments, however, was postponed and the Convention adjourned for lunch.

At 2:45 P.M. the Convention reconvened and received the reports of the Secretary of the Board, Samuel C. Henry, and the Treasurer of the Convention, Samuel L. Hilton.

The report of the Chairman of the Committee of Revision, E. Fullerton Cook, was presented and a statement of suggested principles was offered by Robert C. Wilson as a guide in the preparation of the Pharmacopœia. These were referred to the Board of Trustees for consideration. The session adjourned at 5:45 P.M. and reassembled the following morning and immediately received and acted upon the report of the Committee on the President's address and the report of the Chairman of the Revision Committee. This was followed by the report of the Secretary of the Convention, L. E. Warren.

Dr. Fishbein then presented resolutions calling for the appointment of a special Committee to revise the Constitution and By-Laws of the

Pharmacopœial Convention and to report at an adjourned session of the Convention to be called within two years. The resolutions were approved.

The report of the Nominating Committee was then presented and the nominees for Officers of the Convention, the Board of Trustees, and the Committee of Revision were elected and installed.

Other resolutions and reports were presented by delegates and the general principles recommended to be followed in preparing future revisions of the Pharmacopœia, which had been prepared by the Executive Committee of Revision, were submitted, discussed, and adopted with only slight modification.

The Convention then acted upon the amendments to the Constitution and By-Laws which had been offered and the Convention adjourned at 12:30 P.M. on May 15, 1940, to reassemble on call to receive the report of the Committee on Constitution and By-Laws.

An Abstract of Proceedings of the 1940 Convention has been published by the Board of Trustees and may be obtained on application, and by enclosing 10 cents postage, to L. E. Warren, Secretary of the U. S. P. Convention, 2 Raymond St., Chevy Chase, Md.

THE MEMBERSHIP OF THE U. S. PHARMACOPŒIAL CONVENTION, INC., 1940

The Members of the U. S. Pharmacopœial Convention, Inc., of 1940 consisted of the officers of the convention of 1930, the Board of Trustees, the Committee of Revision of 1930-1940, and the following registered delegates:

U. S. GOVERNMENT SERVICES

Medical Department of the Army: Lt. Col. Albert W. Kenner, U. S. Army, Ft. Meyer, Va.

Medical Department of the Navy: Rear Admiral Harold W. Smith,† Naval Medical Center, Washington, D. C.

U. S. Public Health Service: James P. Leake, National Institute of Health, Bethesda, Md.; Walter T. Harrison, 1851 Columbia Road, Washington, D. C.; M. I. Smith, National Institute of Health, Washington, D. C.

U. S. Department of Agriculture: Herbert O. Calvery, Food and Drug Administration, Washington, D. C.; Theodore G. Klumpp, 33 Riverside Drive, Rensselaer, N. Y.; A. G. Murray, Food and Drug Administration, Washington, D. C.

U. S. Department of Commerce: C. C. Concannon, Bureau of Foreign and Domestic Commerce, Washington, D. C.; E. A. Chapman, Bureau of Foreign and Domestic Commerce, Washington, D. C.; Edward Wichers, National Bureau of Standards, Washington, D. C.

† Rear Admiral Smith was appointed by the Surgeon General, his credentials were accepted, but he was unable to attend the Convention because of other duties.

NATIONAL ORGANIZATIONS

Association of Official Agricultural Chemists: W. F. Reindollar, Department of Health, Bureau of Chemistry, Baltimore, Md.; W. W. Skinner, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Washington, D. C.; Lewis E. Warren, 2 Raymond St., Chevy Chase, Md.

National Association of Boards of Pharmacy: George A. Moulton, Peterborough, N. H.; Robert L. Swain, Drug Topics, 330 W. 42nd St., New York, N. Y.; A. C. Taylor, 1733 Upshur St. N. W., Washington, D. C.

American Chemical Society: Joseph Rosin, Merck & Co., Inc., Rahway, N. J.; John F. Ross, J. T. Baker Chemical Co., Phillipsburg, N. J.; E. H. Volwiler, Abbott Laboratories, North Chicago, Ill.

Association of Food and Drug Officials of the United States: H. J. Fisher, Agricultural Experiment Station, New Haven, Conn.; W. A. Queen, Department of Agriculture, Raleigh, N. C.

American Veterinary Medical Association: H. E. Moskey, Food and Drug Administration, Washington, D. C.; Russell L. Mundhenk, % Lederle Laboratories, Pearl River, N. J.

American Pharmaceutical Manufacturers' Association: John G. Searle, 4737 Ravenswood Avenue, Chicago, Ill.; Russell J. Fosbinder, 250 High St., Newark, N. J.; Charles E. Vanderkleed, 2900 North 17th St., Philadelphia, Pa.

American College of Physicians: Charles F. Tenney, 47 E. 66th St., New York, N. Y.; Torald Sollmann, 2109 Adelbert Road, Cleveland, O.; Edward D. Spalding, 5057 Woodward Ave., Detroit, Mich.

American Hospital Association: Worth L. Howard, City Hospital of Akron, Akron, O.

The National Association of Retail Druggists: John W. Dargavel, 205 West Wacker Drive, Chicago, Ill.; John A. Goode, 53 Patton Ave., Asheville, N. C.

American Drug Manufacturers' Association: S. DeWitt Clough, Abbott Laboratories, North Chicago, Ill.; Carson P. Frailey, 506 Albee Building, Washington, D. C.; F. O. Taylor, Parke, Davis & Co., Detroit, Mich.

National Wholesale Druggists' Association: E. L. Newcomb, 330 West 42nd St., New York, N. Y.; John R. Rippetoe, Schieffelin & Co., 16 Cooper Square, New York, N. Y.

American Medical Association: Paul Nicholas Leech,* 535 North Dearborn St., Chicago, Ill.; Ludvig Hektoen, 629 S. Wood St., Chicago, Ill.; Morris Fishbein, 535 North Dearborn St., Chicago, Ill.

American Dental Association: Harry Lyons, 306 Professional Bldg., Richmond, Va.; Thomas J. Hill, Western Reserve University, School of Dentistry, Cleveland, O.; Harold L. Hansen, 212 East Superior St., Chicago, Ill.

American Pharmaceutical Association: E. F. Kelly, 2215 Constitution Ave., Washington, D. C.; Justin L. Powers, 2215 Constitution Ave., Washington, D. C.; H. A. K. Whitney, University Hospital, Ann Arbor, Mich.

ALABAMA

Alabama Polytechnic Institute, School of Chemistry and Pharmacy: Geo. W. Hargreaves, Auburn, Ala.

* Deceased.

The Howard College, Department of Pharmacy: Benton C. Shafer, The Howard College, Birmingham, Ala.; John R. Warren, Birmingham, Ala.

ARIZONA

Arizona Pharmaceutical Association: Franklin D. Gassaway, University of Maryland, College of Pharmacy, Baltimore, Md.

ARKANSAS

Arkansas Pharmaceutical Association: C. L. Cox, Rutgers University, New Jersey College of Pharmacy, Newark, N. J.; Frank A. Delgado, 1620 Fuller St. N. W., Washington, D. C.

CALIFORNIA

College of Medical Evangelists: Lester H. Lonergan, Loma Linda, Cal.

University of California, College of Pharmacy: Carl L. A. Schmidt, University of California, College of Pharmacy, Medical Center, San Francisco, Cal.

University of California, Medical School: John B. Lagen, University of California Medical School, San Francisco, Cal.

University of Southern California, College of Pharmacy: George W. Fiero, Buffalo College of Pharmacy, Buffalo, N. Y.; Alvah G. Hall, 828 E. Sunset Canyon Drive, Burbank, Cal.; Willard G. Smith, 4171 Central Terrace, Los Angeles, California.

California Pharmaceutical Association: Rowland Jones, Jr., 1163 National Press Bldg., Washington, D. C.

COLORADO

University of Colorado, College of Pharmacy: David W. O'Day, Boulder, Colo.

Colorado Pharmacal Association: Paul G. Stodghill, 319—16th St., Denver, Colo.; Chas. J. Clayton, 1042 E. Colfax Ave., Denver, Colo.

CONNECTICUT

Yale University, School of Medicine: Henry Gray Barbour, 333 Cedar St., New Haven, Conn.; Arthur Joseph Geiger, 789 Howard Ave., New Haven, Conn.

Connecticut State Medical Society: John H. Foster, 77 N. Main St., Waterbury, Conn.; John A. Wentworth, 50 Farmington Ave., Hartford, Conn.

Connecticut College of Pharmacy: Henry S. Johnson, 150 York St., New Haven, Conn.; Charles W. Whittlesey,* 438 Humphrey St., New Haven, Conn.; A. L. Omohundro, McKesson Laboratories, Bridgeport, Conn.

CUBA

Academia de Ciencias Médicas, Físicas y Naturales de la Habana: Francisco Hidalgo, Calle B entre 12 y 14, Reparto Almendares, Habana, Cuba.

University of Havana, School of Pharmacy: Celestino Garcia Morales, Maximo Gomez 414, Habana, Cuba; Maria Amelia Mesa de Ponce, Calle Juan Delgado 455, Habana, Cuba.

Asociacion Farmaceutica Nacional: Eduardo Palacios Planas, Neptuno 866 1er. piso derecha, Habana, Cuba; Jorge A. Dominicis, Malecon 307, Habana, Cuba.

Federacion medica de Cuba: Gualberto M. Ponce, Calle Juan Delgado 455, Habana, Cuba.

* Deceased.

DELAWARE

Delaware Pharmaceutical Association: George W. Rhodes, Newark, Del.; George W. Brittingham, Medical Arts Building, Wilmington, Del.; Albert Bunin, 1713 W. Fourth St., Wilmington, Del.

DISTRICT OF COLUMBIA

George Washington University, School of Medicine: George B. Roth, 3814 T St., N. W., Washington, D. C.; L. G. Gramling, George Washington University, Washington, D. C.

District of Columbia Medical Society: Charles B. Campbell, 900—17th St., N. W., Washington, D. C.; Fred A. J. Geier, 1029 Vermont Ave., N. W., Washington, D. C.; N. Norman Smiler, 1835—16th St., N. W., Washington, D. C.

Georgetown University, School of Medicine: Theodore Koppanyi, 3900 Reservoir Road, N. W., Washington, D. C.; Reginald A. Cutting, 3900 Reservoir Road, Washington, D. C.; Wallace M. Yater, 3900 Reservoir Road, Washington, D. C.

Howard University, College of Pharmacy: Chauncey I. Cooper, 1858 California St., N. W., Washington, D. C.; Daniel H. Smith, 3111—11th St., N. W., Washington, D. C.

Howard University, College of Medicine: Vernon A. Wilderson, Howard University, Washington, D. C.; Alonzo DeGrate Smith, Howard University, Washington, D. C.

George Washington University, School of Pharmacy: W. Paul Briggs, George Washington University, Washington, D. C.; S. L. Hilton, 2152 L St., N. W., Washington, D. C.; Charles O. Wilson, University of Minnesota, Minneapolis, Minn.

FLORIDA

Florida State Pharmaceutical Association: J. K. Attwood, 1024 Park St., Jacksonville, Fla.; James H. Beal, Route 1, Cocoa, Fla.; R. Q. Richards, Royal Palm Pharmacy, Ft. Myers, Fla.

University of Florida, School of Pharmacy: P. A. Foote, University of Florida, Gainesville, Fla.; W. J. Husa, University of Florida, Gainesville, Fla.; T. R. Leigh, University of Florida, Gainesville, Fla.

Florida Medical Association: M. J. Myres, Health Department, City of Daytona Beach, Fla.; Edwin C. Swift, Greenleaf Building, Jacksonville, Fla.; William Emrich, 201 Liberty St., Orlando, Fla.

GEORGIA

Georgia Medical Association: Allen H. Bunce, 139 Forrest Avenue, N. E., Atlanta, Ga.; Carl C. Aven, Medical Arts Building, Atlanta, Ga.

Emory University, School of Medicine: Eugene Jackson, Emory University, Atlanta, Ga.

University of Georgia School of Medicine: Robert A. Woodbury, University of Georgia, School of Medicine, Augusta, Ga.

Southern College of Pharmacy: R. C. Hood, 223 Walton St., Atlanta, Ga.

University of Georgia, School of Pharmacy: Robert C. Wilson, Athens, Ga.; W. Taylor Sumerford, Athens, Ga.; A. H. Fiske, Indianapolis, Ind.

Georgia Pharmaceutical Association: Charles H. Evans, Warrenton, Ga.; E. E. Swanson, Eli Lilly & Co., Indianapolis, Ind.

IDAHO

University of Idaho, College of Pharmacy: H. George DeKay, School of Pharmacy, Purdue University, Lafayette, Ind.; Y. C. Campbell, Schieffelin and Co., 16 Cooper Square, New York, N. Y.; Joseph J. Piffner, 1217 Baldwin Ave., Ann Arbor, Mich.

ILLINOIS

Loyola University, School of Medicine: Harold N. Ets, 706 South Wolcott Ave., Chicago, Ill.

University of Illinois, College of Medicine: S. W. Morrison, 1853 West Polk St., Chicago, Ill.; Ralph E. Terry, 1853 West Polk St., Chicago, Ill.

University of Illinois, College of Pharmacy: Edmund N. Gathercoal, 808 South Wood St., Chicago, Ill.; Elmer H. Wirth, 808 South Wood St., Chicago, Ill.; George L. Webster, 808 South Wood St., Chicago, Ill.

Illinois Pharmaceutical Association: Julius H. Riemenschneider, 2916 Broadway, Chicago, Ill.; Samuel C. Henry, 244 E. Pearson St., Chicago, Ill.; Harold H. Schmid, 30 E. 111th St., Chicago, Ill.

University of Chicago, School of Medicine: Carl C. Pfeiffer, Department of Pharmacology, University of Chicago, Chicago, Ill.

Illinois State Medical Society: J. J. Gill, 5708 Harper Ave., Chicago, Ill.

Northwestern University, Medical School: Carl A. Dragstedt, 303 E. Chicago Ave., Chicago, Ill.

INDIANA

Indiana State Medical Association: Samuel Kennedy, Shelbyville, Ind.; William B. Challman, Mount Vernon, Ind.

Indiana University, School of Medicine: Frank B. Fisk, 5430 N. New Jersey St., Indianapolis, Ind.; Raymond M. Rice, 5365 N. New Jersey St., Indianapolis, Ind.; C. R. Schaefer, 20 Bar Association Bldg., Indianapolis, Ind.

Valparaiso University, College of Pharmacy: C. J. Klemme, Burroughs Wellcome Co., Tuckahoe, N. Y.; C. J. Zufall, 617 Waldron St., West Lafayette, Ind.

Purdue University, School of Pharmacy: C. B. Jordan,* Purdue University, Lafayette, Ind.; C. O. Lee, Purdue University, Lafayette, Ind.; Francis E. Bibbins, Eli Lilly & Co., Indianapolis, Ind.

Indiana Pharmaceutical Association: Ira V. Rothrock, 231 Main St., Mount Vernon, Ind.; Carl E. Nelson, 5635 Calumet Ave., Hammond, Ind.; Francis A. Britt, 1 North Fulton Ave., Evansville, Ind.

Indianapolis College of Pharmacy: Edward H. Niles, 802 Market St., Indianapolis, Ind.; Waldon F. Ambroz, 4214 Carrollton Ave., Indianapolis, Ind.; Charles J. Lynn, 5600 Sunset Lane, Indianapolis, Ind.

IOWA

University of Iowa, College of Pharmacy: Zada M. Cooper, Iowa City, Ia.; R. A. Kuever, Iowa City, Ia.; Louis C. Zopf, Iowa City, Ia.

Iowa Pharmaceutical Association: H. H. Gibbs, Iowa City, Ia.; J. W. Slocum, Indianola, Ia.; George Judisch, Ames, Ia.

Drake University, College of Pharmacy: F. S. Bukey, University of Nebraska, Lin-

* Deceased.

coln, Neb.; Elbert O. Kagy, Drake University, Des Moines, Ia.; Denny Brann,* 720 Locust St., Des Moines, Ia.

KANSAS

Kansas Pharmaceutical Association: Otto Kuether, Herington, Kansas.

KENTUCKY

Louisville College of Pharmacy: Gordon L. Curry, 104 W. Chestnut St., Louisville, Ky.; Arthur P. Markendorf, 22nd and Broadway, Louisville, Ky.; Clarence B. Davis, 1st and Breckenridge Sts., Louisville, Ky.

Kentucky State Medical Association: Virgil E. Simpson, Brown Bldg., Louisville, Ky.; Luther Bach, 42 York St., Newport, Ky.

Kentucky Pharmaceutical Association: T. W. Hoskins, 4305 Southern Parkway Louisville, Ky.; E. M. Josey, Frankfort, Ky.; M. A. Vaughn, Bowling Green, Ky.

LOUISIANA

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Xavier University, College of Pharmacy: Lawrence Ferring, Xavier University, College of Pharmacy, New Orleans, La.

Louisiana State Pharmaceutical Association: A. P. Lauve, New Orleans, La.; E. C. Harper, Mangham, La.

Louisiana State University, School of Medicine: George W. McCoy, 1542 Tulane Ave., New Orleans, La.

MARYLAND

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University of Maryland, School of Pharmacy: A. G. DuMez, 32 S. Greene St., Baltimore, Md.; M. J. Andrews, 32 S. Greene St., Baltimore, Md.; C. W. Chapman, 32 S. Greene St., Baltimore, Md.

Maryland Pharmaceutical Association: L. M. Kantner, 2411 N. Charles St., Baltimore, Md.; H. A. B. Dunning, Charles and Chase Sts., Baltimore, Md.; A. N. Hewing, 701 N. Lakewood Ave., Baltimore, Md.

Johns Hopkins University, School of Medicine: E. K. Marshall, Jr., Johns Hopkins Medical School, Baltimore, Md.; Morris Rosenfeld, Johns Hopkins Medical School, Baltimore, Md.; Perrin H. Long, Johns Hopkins Medical School, Baltimore, Md.

Johns Hopkins University, School of Hygiene and Public Health: Olaf S. Rask, 615 N. Wolfe St., Baltimore, Md.

Medical and Chirurgical Faculty of the State of Maryland: Charles C. W. Judd, 222 Wendover Road, Baltimore, Md.; David I. Macht, 3420 Auchentoroly Terrace, Baltimore, Md.

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MASSACHUSETTS

Massachusetts Medical Society: Soma Weiss,* Peter Bent Brigham Hospital, Boston, Mass.; Harold J. Jeghers, 80 East Concord St., Boston, Mass.; William B. Castle, Boston City Hospital, Boston, Mass.

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Harvard University, Medical School: Otto Krayner, Harvard Medical School, Boston, Mass.; Henry Knowles Beecher, Massachusetts General Hospital, Boston, Mass.; Charles Lyman Short, 264 Beacon St., Boston, Mass.

Massachusetts College of Pharmacy: Ralph R. Patch, 179 Longwood Ave., Boston, Mass.; Heber W. Youngken, 179 Longwood Ave., Boston, Mass.; Howard C. Newton, 179 Longwood Ave., Boston, Mass.

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College of Physicians and Surgeons: Frederick W. Connolly, 7 Fenno Place, Dorchester, Mass.; Sidney Hyman Harmon, 282 Columbia Road, Roxbury, Mass.

MICHIGAN

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Michigan State Pharmaceutical Association: W. W. F. Enz, Kalamazoo, Mich.; E. D. Mayo, Kalamazoo, Mich.

Ferris Institute, College of Pharmacy: Simon Benson, Ferris Institute, Big Rapids, Mich.; Frank T. Gillespie, 220 State St., St. Joseph, Mich.; A. G. Buchman, Iron Mountain, Mich.

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Wayne University, College of Medicine: John D. Ralston, 4118 Courville Rd., Detroit, Mich.

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University of Michigan, College of Pharmacy: Charles H. Stocking, College of Pharmacy, University of Michigan, Ann Arbor, Mich.; Howard B. Lewis, College of Pharmacy, University of Michigan, Ann Arbor, Mich.

MINNESOTA

Minnesota State Medical Association: A. E. Osterberg, Mayo Clinic, Rochester, Minn.; R. N. Bieter, University of Minnesota, Minneapolis, Minn.

* Deceased.

† Resigned at the close of the first day. The vacancy was filled by his alternate, R. L. McCabe.

Minnesota State Pharmaceutical Association: Glenn L. Jenkins, Purdue University, College of Pharmacy, Lafayette, Ind.; F. W. Moudry, 364 St. Peter St., St. Paul, Minn.; Hallie F. Bruce, University Hospital, University of Minnesota, Minneapolis, Minn.

University of Minnesota, College of Pharmacy: Charles H. Rogers, University of Minnesota, Minneapolis, Minn.; Earl B. Fischer, University of Minnesota, Minneapolis, Minn.; Charles V. Netz, University of Minnesota, Minneapolis, Minn.

University of Minnesota, Medical School: Raymond M. Amberg, University of Minnesota Hospital, Minneapolis, Minn.; Arthur D. Hirschfelder, University of Minnesota, Medical School, Minneapolis, Minn.; Harold N. Wright, University of Minnesota, Medical School, Minneapolis, Minn.

MISSISSIPPI

Mississippi State Pharmaceutical Association: Lew Wallace, Laurel, Miss.; W. H. Rose, West Point, Miss.; Chas. E. Wilson, Corinth, Miss.

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MONTANA

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NEW HAMPSHIRE

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Medical Society of the County of New York: Arthur C. DeGraff, 850 Park Avenue, New York, N. Y.; David H. Orgel, 108 East 91st St., New York, N. Y.

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University of Buffalo, School of Pharmacy: A. B. Lemon, School of Pharmacy, Buffalo, N. Y.; H. G. Hewitt, School of Pharmacy, Buffalo, N. Y.; L. D. Lockie, School of Pharmacy, Buffalo, N. Y.

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NORTH CAROLINA

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The North Carolina Pharmaceutical Association: C. C. Fordham, Jr., Greensboro, N. C.; Joseph Hollingsworth, Mount Airy, N. C.; Carl T. Durham, Chapel Hill, N. C.

Duke University, School of Medicine: J. P. Hendrix, Duke University, School of Medicine, Durham, N. C.; I. T. Reamer, Duke Hospital, Durham, N. C.; E. C. Hamblen, Duke University, School of Medicine, Durham, N. C.

NORTH DAKOTA

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North Dakota Agricultural College, School of Pharmacy: W. F. Sudro, State College Station, Fargo, N. D.; Erwin E. Fraase, 1021 Washington-Baltimore Blvd., Hyattsville, Md.; Charles L. Semling, 1915 K St., N. W., Washington, D. C.

OHIO

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University of the City of Toledo, College of Pharmacy: Bess G. Emch, University of the City of Toledo, Toledo, O.; Elmon L. Cataline, University of Michigan, College of Pharmacy, Ann Arbor, Mich.; C. I. Bliss, 413 Columbus Ave., Sandusky, O.

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Western Reserve University, School of Pharmacy: Edward Spease, 205 W. Wacker Drive, Chicago, Ill.; Leroy D. Edwards, 526 E. 8th St., Gainesville, Fla.

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The Northern Ohio Druggists' Association: A. P. Gegenheimer, 3096 Mayfield Rd., Cleveland Heights, O.; Jos. T. Matousek, 10110 Euclid Ave., Cleveland, O.; Harry G. Baskind, 12414 Buckeye Rd., Cleveland, O.

The Ohio State Pharmaceutical Association: L. W. Funk, 731 North High St., Columbus, O.; M. N. Ford, State Office Bldg., Columbus, O.; G. F. Emch, Cor. South & Spencer Sts., Toledo, O.

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OKLAHOMA

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OREGON

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PENNSYLVANIA

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Duquesne University, School of Pharmacy: Hugh C. Muldoon, Duquesne University, Pittsburgh, Pa.; Ralph R. Kreuer, Duquesne University, Pittsburgh, Pa.; Stanley P. Porter, Duquesne University, Pittsburgh, Pa.

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Mellon Institute of Industrial Research: George D. Beal, Mellon Institute, Pitts-

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The Philadelphia County Medical Society: Mitchell Bernstein, 1321 Spruce St., Philadelphia, Pa.; Leonard G. Rowntree, Philadelphia General Hospital, 34th and Pine Sts., Philadelphia, Pa.

THE PHILIPPINES

University of the Philippines, College of Pharmacy: Felix Hocson, University of the Philippines, College of Pharmacy, Manila, P. I.; Patrocinio Valenzuela, University of the Philippines, College of Pharmacy, Manila, P. I.

PUERTO RICO

University of Puerto Rico, College of Pharmacy: José Menéndez, University of Puerto Rico, Rio Piedras, P. R.

Colegio de Farmaceuticos de Puerto Rico: Gilberto Rivera Hernández, School of Tropical Medicine, San Juan, P. R.

School of Tropical Medicine: Joseph H. Axtmayer, School of Tropical Medicine, San Juan, P. R.

RHODE ISLAND

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SOUTH CAROLINA

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SOUTH DAKOTA

South Dakota State College of Agriculture and Mechanical Arts, Division of Pharmacy: Floyd J. LeBlanc, Brookings, S. D.; Clark T. Eidsmoe, Brookings, S. D.

South Dakota Pharmaceutical Association: E. C. Severin, Philip, S. D.; Kenneth Jones, Gettysburg, S. D.

TENNESSEE

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TEXAS

Texas Pharmaceutical Association: Eugene G. Eberle, Constitution Ave. and 22nd St., N. W., Washington, D. C.

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VERMONT

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VIRGINIA

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WASHINGTON

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WEST VIRGINIA

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WISCONSIN

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Wisconsin State Medical Society: Theodore Wiprud, Medical Society of the District of Columbia, Washington, D. C.

GENERAL PRINCIPLES RECOMMENDED BY THE U. S. P.
CONVENTION OF 1940, TO BE FOLLOWED IN REVISING
THE PHARMACOPŒIA

1. *Object and Scope of the Pharmacopœia*—The object of the Pharmacopœia is to provide standards for drugs and medicines of therapeutic usefulness or pharmaceutical necessity, sufficiently used in medical practice within the United States or its possessions; to lay down tests for the identity, quality, and purity of these; to insure, so far as practicable, uniformity in physical properties and active constituents.

It is recommended that the Committee of Revision be authorized to admit into the Pharmacopœia a carefully selected list of medicinal substances of known origin, but no substance or combination of substances shall be introduced if either the composition or mode of manufacture thereof be kept secret. A statement shall be placed in the Preface to the effect that standards for purity and strength, described in the text of the Pharmacopœia, are intended to apply solely to substances which are to be used for medicinal purposes, or for determining their identity and purity.

2. *Doses*—It is recommended that for Pharmacopœial substances which are intended for therapeutic purposes, the Committee of Revision be instructed to state, where feasible, the average (neither minimum nor maximum) doses for adults, and, where deemed advisable, also for children. The term "average dose" is to be interpreted as the dose which might reasonably be expected to produce the therapeutic effect for which the substance is most commonly employed. The metric system is to be used, followed by approximate equivalents in apothecaries' weights and measures. It is to be understood that neither this Convention nor the Committee of Revision created by it intends to have these doses regarded as obligatory on the physician or as forbidding him to exceed the dose given, whenever, in his judgment, this may seem advisable; the Committee of Revision shall make a declaration to this effect in some prominent place in the Pharmacopœia.

3. *Nomenclature*—It is recommended that changes in the titles of articles at present official be made only for the purpose of insuring greater accuracy, brevity, or safety in dispensing or to provide conformity with international usage, and to eliminate therapeutically suggestive titles.

In the case of newly admitted articles, it is recommended that such titles be chosen as are in harmony with general usage and convenient for prescribing; for synthetic chemicals, with lengthy or unwieldy

names, the Committee of Revision shall be empowered to coin short titles, preferably based upon the true chemical names, but in the case of chemicals of definite composition the scientific name shall be given, at least as a synonym.

There may also be inserted, after each official English title, an abbreviated title, to be known as the official abbreviation.

It is recommended that botanical and zoological names shall conform to the rules of the International Botanical Congress and the International Zoölogical Congress, and that chemical names shall conform, so far as possible, to those used in *Chemical Abstracts*, published by the American Chemical Society.

4. *Synonyms*—It is recommended that the use of synonyms shall be continued and that the synonyms shall be printed in the text of the Pharmacopœia immediately after the official English title of the substance. When a substance is known in commerce under more than one commonly used English name, such vernacular titles shall, as far as desirable, be given as synonyms. A statement shall be made in the Preface of the Pharmacopœia that substances designated by an official synonym must comply with the same standards, tests, and requirements as are demanded for the substances under the official title.

5. *Standards for Purity, Quality, and Strength*—It is recommended that the Committee of Revision be instructed to provide standards of purity, quality, and strength for Pharmacopœial substances for which limiting tests are or may be given. While no concession should be made toward diminution of medicinal value, an allowance may be made for unavoidable innocuous impurities. Official preparations are to be made only from drugs that conform to the Pharmacopœial standards, definitions, and descriptions. Vegetable drugs are to be as free as practicable from insects or other animal life, animal material, or animal excreta. They are to be free from moldiness and shall show no discoloration, abnormal odor, sliminess, or deterioration due to any cause.

6. *International Standards*—It is recommended that potent remedies be made to conform to the standards of the International Commission of Pharmacopœial Experts in so far as it is deemed advisable by the Committee of Revision.

7. *General Formulas and Methods*—It is recommended that general formulas for the manufacture of pharmaceutical preparations and general methods for the examination of drugs and tests for chemicals and preparations be given when practicable, and that the application

of these formulas and methods be indicated by reference in the respective monographs.

8. *Appending the Title or Titles of Preparations in Which an Official Substance Is Used*—It is recommended that there shall be included in the monograph of each substance the title or titles of the official preparation or preparations in which it is an essential therapeutic ingredient.

9. *Alcoholic Percentage in Official Preparations*—It is recommended that the permissible range for the content of absolute alcohol, by volume, be included in the monograph of each preparation containing significant quantities of alcohol.

10. *Assay Processes*—It is recommended that assay processes shall be included for as many of the drugs and preparations made therefrom as may be found practicable, and which lead to fairly uniform results when applied by different analysts; wherever feasible, tests for identity and purity are to be given for the products of such assays.

11. *Reference Standards*—It is recommended that the policy of establishing and distributing Reference Standards be approved and continued.

12. *Weights and Measures*—It is recommended that the Committee of Revision be instructed to retain the metric system of weights and measures.

13. *Atomic Weights*—It is recommended that the atomic weights adopted in the revision shall be in accordance with the latest available report of the International Committee on Chemical Elements.

14. *Physical Constants*—It is recommended that official methods for determining physical constants shall be stated in the Pharmacopœia, and these shall apply to all articles in which physical constants are officially used, unless specifically excepted.

15. *Standard Temperature*—It is recommended that the standard temperature of 25° C. (77° F.) be retained (except for alcohol or other special cases).

16. *Alcoholometric Tables*—It is recommended that an alcoholometric table be inserted giving the percentages of alcohol at different temperatures.

17. *Pharmacognostic Descriptions*—It is recommended that the descriptions of crude drugs shall include brief, pharmacognostic descriptions, both macroscopic and microscopic where practicable; and, as a means of detecting adulteration, there shall be added a statement of the appearance of the distinctive structural elements in the powder, when examined microscopically.

18. *Powdered Drugs*—It is recommended that powdered drugs be required to represent the entire drug unless specifically stated otherwise.

19. *Solubilities*—It is recommended that pharmaceutically useful solubilities be given as completely as practicable.

20. *Sterilization*—It is recommended that a chapter on sterilization be retained.

21. *Publicity*—It is recommended that the Committee of Revision make public, for comment and criticism, important changes in preparations and standards proposed, before final adoption.

22. *Formulation of Rules*—In all matters not especially provided for by the Convention, the Committee of Revision is empowered to formulate such rules as it considers necessary.

23. *Date When Pharmacopœias Become Official*—It is recommended that the Board of Trustees, after consultation with the Committee of Revision, announce a definite date, reasonably distant from the actual date of publication, when each Pharmacopœia is to become official, and it is recommended that this date be printed on the title page of the new Pharmacopœia.

24. *Spanish Edition*—It is recommended that each revision of the United States Pharmacopœia be translated into the Spanish Language and published.

25. *Interim Revisions*—It is recommended that the Committee of Revision be authorized to prepare Interim Revisions providing for admissions to or changes in the Pharmacopœia and to issue the same separately as “Interim Announcements” or collectively as “Supplements.” It is recommended that the Board of Trustees, after consultation with the Committee of Revision, shall announce a definite date, reasonably distant from the actual date of publication, when the interim revision is to become official, and it is recommended that this date be printed upon each announcement or supplement.

26. *The Pharmacopœia of the United States of America*—Where the words “Pharmacopœia” or “United States Pharmacopœia” appear in these General Principles or elsewhere in this book, they refer to the Pharmacopœia of the United States of America.

INTERNATIONAL PROTOCOL (P. I.) STANDARDS*

(Brussels Conference, 1925)

Compared with Drugs and Preparations of the U. S. P. XII

International Protocol (P. I.)

U. S. P. XII

ARSENIC

Natrii Arsenas

Crystalline salt 36.85 per cent of
arsenic pentoxide.

Not official in the U. S. P. XII.

Solutio arsenicalis seu Fowleri

Neutral solution.
1 per cent of arsenic trioxide.

Liquor Potassii Arsenitis

100 cc. contains 1 Gm. of As_2O_3 .

BELLADONNA

Atropa Belladonna L.

Belladonnæ folium
Dried leaf.

Atropa Belladonna L.

Belladonnæ Folium
Dried leaf and top; 0.3 per cent of
alkaloids.

Pulvis Belladonnæ

0.3 per cent of total alkaloids.
Diluent, rice starch.

Included under *Belladonnæ Folium*.

Tinctura Belladonnæ

0.03 per cent of total alkaloids.
Menstruum, 70 per cent alcohol.

Tinctura Belladonnæ

0.03 per cent of total alkaloids.
Menstruum, 71 per cent alcohol.

Extractum Belladonnæ

1.30 per cent of total alkaloids.
Menstruum, 70 per cent alcohol.

Extractum Belladonnæ

1.25 per cent of total alkaloids.
Menstruum, 71 per cent alcohol for
the pilular extract and alcohol for the
powdered extract.

Evaporate extract below 50° C.
Free from chlorophyll.

Evaporate at not over 60° C.
No requirement.

Both pilular and powdered extract
included.

Sirupus Belladonnæ

Contains 5 per cent of Tinctura
Belladonnæ.

Not official in the U. S. P. XII.

Unguentum Belladonnæ

10 per cent of Extractum Bella-
donnæ.

Unguentum Belladonnæ

10 per cent of pilular extract of
belladonna.

COCAINE HYDROCHLORIDE

Cocaini hydrochloridum
Anhydrous salt.

Cocainæ Hydrochloridum
Anhydrous salt.

COLCHICUM

Colchicum autumnale L.

Colchici Semen
Dried seed.

Colchicum autumnale L.

Colchici Semen
Dried, ripe seed.

Pulvis Colchici

0.4 per cent of colchicine.
Diluent, rice starch.

0.45 per cent of colchicine.
Included under *Colchici Semen*.

*Alcohol and acids referred to in the menstrua of U. S. P. preparations listed in this table are those of Pharmacopœial strength.

International Protocol (P. I.)**Tinctura Colchici**

0.04 per cent of colchicine.

Menstruum, 70 per cent alcohol.

Extractum Colchici

2 per cent of colchicine.

U. S. P. XII**Tinctura Colchici Seminis**

100 cc. yields 0.040 Gm. of total alkaloids.

Menstruum, 63 per cent alcohol.

Not official in the U. S. P. XII.

DIGITALIS**Digitalis purpurea L.****Digitalis folium**

Leaf, dried at 55° to 60° C.

Digitalis purpurea L.**Digitalis**

Dried leaf.

Biologically standardized: 0.1 Gm. equivalent to not less than 1 U. S. P. Digitalis unit (equivalent to 1 International unit).

Pulvis Digitalis**Digitalis Pulverata**

Biologically standardized: 0.1 Gm. equivalent to 1 U. S. P. Digitalis unit. Not official in the U. S. P. XII.

Sirupus Digitalis

Contains 5 per cent of Tincture of Digitalis.

Tinctura Digitalis

10 per cent of the drug by weight.

Menstruum, 70 per cent alcohol.

Tinctura Digitalis

Biologically standardized: 1 cc. equivalent to 1 U. S. P. Digitalis unit. Menstruum, 76 per cent of alcohol.

ERGOT**Claviceps purpurea Tul.****Secale cornutum**

Ergot of rye of the same year, preserved whole.

Claviceps purpurea Tul.**Ergota**

Dried sclerotium developed on rye plants.

Biologically standardized: 1 Gm. equivalent to not less than 0.5 milligram of ergotoxine ethanesulfonate. Not official in the U. S. P. XII.

Extractum secalis cornuti aquosum

An aqueous extract, dissolved in 60 per cent alcohol.

Extractum secalis cornuti fluidum

100 cc. represents 100 Gm. of the drug.

Not official in the U. S. P. XII.

Extractum secalis cornuti fluidum acidum

100 cc. represents 100 Gm. of the drug.

Fluidextractum Ergotæ

Not standardized: 100 cc. represents 100 Gm. of the drug.

GLYCERYL TRINITRATE**Solutio nitroglycerini spirituosus**

1 per cent, by weight, of nitroglycerin.

Spiritus Glycerylis Trinitratis

1 to 1.1 per cent of glyceryl trinitrate.

International Protocol (P. I.)

U. S. P. XII

HYOSCYAMUS

Hyoscyamus niger L.
Hyoscyami folium
 Leaf, dried.

Extractum Hyoscyami

Menstruum, 70 per cent alcohol.

Evaporate extracts below 50° C.
 Free from chlorophyll.

Tinctura Hyoscyami
 10 per cent of the drug by weight.

Menstruum, 70 per cent alcohol.

Hyoscyamus niger L.
Hyoscyamus

Dried leaf, with or without tops.
 0.040 per cent of hyoscyamus alkaloids.

Extractum Hyoscyami

0.155 per cent of hyoscyamus alkaloids.

Menstruum, 71 per cent alcohol for the pilular extract and alcohol for the powdered extract.

Evaporate at not over 60° C.

No requirement.

Tinctura Hyoscyami

100 cc. yields 0.0040 Gm. of hyoscyamus alkaloids.

Menstruum, 71 per cent alcohol.

IODINE

Solutio iodi spirituosa

Iodine 6.5 Gm., potassium iodide, 2.5 Gm. or a corresponding quantity of sodium iodide.

Alcohol (90 per cent) 91 Gm.

Tinctura Iodi

Iodine 7 Gm., potassium iodide 5 Gm., water 5 cc., alcohol sufficient to make 100 cc.

IPECAC

Uragoga Ipecacuanha H. Bn.

Ipecacuanhæ radix
 Dried root.

Pulvis Ipecacuanhæ

2 per cent of total alkaloids.

Tinctura Ipecacuanhæ

0.2 per cent of total alkaloids.

Menstruum, 70 per cent alcohol.

Sirupus Ipecacuanhæ

Contains 10 per cent of Tinctura Ipecacuanhæ.

Cephaëlis Ipecacuanha (Brot.) A. Rich.
Cephaëlis acuminata Karsten

Ipecacuanha

Dried rhizome and roots.

2 per cent of ether-soluble alkaloids.

Included under Ipecacuanha.

Not official in the U. S. P. XII.

Sirupus Ipecacuanhæ

Contains 7 per cent of fluidextract of ipecac, making the syrup about seven times stronger than the P. I. Sirup.

MERCURY

Sirupus hydrargyri iodidi cum kalii iodido

0.05 per cent of mercuric iodide and 2.5 per cent of potassium iodide.

Unguentum hydrargyri

30 per cent of mercury.

Not official in the U. S. P. XII.

Unguentum Hydrargyri Forte
 50 per cent of mercury.

Unguentum Hydrargyri Mite
 10 per cent of mercury.

MORPHINE

Sirupus morphini

0.05 per cent of morphine hydrochloride.

Not official in the U. S. P. XII.

International Protocol (P. I.)

U. S. P. XII

NUX VOMICA

Strychnos nux-vomica L.**Strychni semen**

Dried seed.

Pulvis Strychni

2.5 per cent of total alkaloids.

Tinctura Strychni

0.25 per cent of total alkaloids.

Menstruum, 70 per cent alcohol.

Extractum Strychni

16 per cent of total alkaloids.

Menstruum, 70 per cent alcohol.

Defatted.

Strychnos Nux-vomica L.**Nux Vomica**

Dried, ripe seed.

1.15 per cent of strychnine.

Included under Nux Vomica.

Tinctura Nucis Vomicae

100 cc. yields 0.115 Gm. of strychnine.

Menstruum, 71 per cent alcohol and 0.75 per cent hydrochloric acid.

Not official in the U. S. P. XII.

OPIUM

Papaver somniferum L.**Opium**

Dried latex of the fruit.

Pulvis Opium

Dried at 60° C.

10 per cent of anhydrous morphine.

Diluent, rice starch or milk sugar.

Pulvis opii et ipecacuanhæ compositus

10 per cent of powdered opium and

10 per cent of powdered Ipecacuanha.

Tinctura opii

1 per cent of anhydrous morphine.

Menstruum, 70 per cent alcohol.

Tinctura opii crocata seu Laudanum Sydenhami

1 per cent of anhydrous morphine.

Tinctura opii benzoica

0.05 per cent of anhydrous morphine.

Extractum opii aquosum

20 per cent of anhydrous morphine.

Sirupus opii

0.05 per cent of anhydrous morphine.

Sirupus opii dilutus seu sirupus diacodii

0.01 per cent of anhydrous morphine.

Papaver somniferum L. or Papaver album
De Candolle**Opium**

Air dried milky exudation of unripe capsules.

9.5 per cent of anhydrous morphine.

Opium Pulveratum

Dried at not over 70° C.

10.25 per cent of anhydrous morphine.

Inert diluent.

Not official in the U. S. P. XII.

Tinctura Opium

100 cc. yields 1 Gm. of anhydrous morphine.

Menstruum, water.

Not official in the U. S. P. XII.

Tinctura Opium Camphorata

100 cc. yields 0.04 Gm. of anhydrous morphine.

Not official in the U. S. P. XII.

Not official in the U. S. P. XII.

Not official in the U. S. P. XII.

ARTICLES ADDED TO THE U. S. PHARMACOPŒIA, TWELFTH

Latin Title	English Title
Acidum Aminoaceticum.....	Aminoacetic Acid
Æthylis Carbamas.....	Ethyl Carbamate
Amaranthum.....	Amaranth
Amyleni Hydras.....	Amylene Hydrate
Aqua pro Injectione.....	Water for Injection
Bentonitum.....	Bentonite
Butacainæ Sulfas.....	Butacaine Sulfate
Butylis Aminobenzoas.....	Butyl Aminobenzoate
Calcii Mandelas.....	Calcium Mandelate
Calx Sodica.....	Soda Lime
Capsulæ Ammonii Chloridi.....	Ammonium Chloride Capsules
Capsulæ Carbonei Tetrachloridi.....	Carbon Tetrachloride Capsules
Capsulæ Digitalis.....	Digitalis Capsules
Capsulæ Diphenylhydantoini Sodici.....	Diphenylhydantoin Sodium Capsules
Capsulæ Ferri et Ammonii Citratum.....	Iron and Ammonium Citrates Capsules
Capsulæ Olei Chenopodii.....	Oil of Chenopodium Capsules
Capsulæ Olei Hippoglossi.....	Halibut Liver Oil Capsules
Capsulæ Oleovitaminæ A.....	Oleovitamin A Capsules
Capsulæ Oleovitaminæ A et D Concentrata.....	Concentrated Oleovitamin A and D Capsules
Capsulæ Pentobarbitali Sodici.....	Pentobarbital Sodium Capsules
Capsulæ Tetrachloroæthyleni.....	Tetrachloroethylene Capsules
Capsulæ Theobrominæ et Sodii Acetatis.....	Theobromine and Sodium Acetate Capsules
Carbarsonum.....	Carbarsone
Carbasus Absorbens.....	Absorbent Gauze
Carbasus Absorbens Adhæsivus.....	Adhesive Absorbent Gauze
Carbasus Absorbens Sterilis.....	Sterile Absorbent Gauze
Chloroazodinum.....	Chloroazodin
Chorda Serica Chirurgicalis.....	Surgical Silk
Chorda Serica Chirurgicalis Sterilis.....	Sterile Surgical Silk
Dihydromorphenoni Hydrochloridum.....	Dihydromorphenone Hydrochloride
Diphenylhydantoinum Sodicum.....	Diphenylhydantoin Sodium
Elixir Phenobarbitali.....	Elixir of Phenobarbital
Emplastrum Adhæsivum Sterile.....	Sterile Adhesive Plaster
Ergonovinæ Maleas.....	Ergonovine Maleate
Ergotaminæ Tartras.....	Ergotamine Tartrate
Estradiolis Benzoas.....	Estradiol Benzoate
Estronum.....	Estrone
Eucatropinæ Hydrochloridum.....	Eucatropine Hydrochloride
Extractum Perpolitionum Oryzæ.....	Extract of Rice Polishings
Ferri Sulfas Exsiccatus.....	Exsiccated Ferrous Sulfate
Gelatum Alumini Hydroxidi.....	Aluminum Hydroxide Gel

Gelatum Alumini Hydroxidi Siccum.....	Dried Aluminum Hydroxide Gel
Globulinum Immune Humanum.....	Human Immune Globulin
Glycerylis Triacetat.....	Glyceryl Triacetate
Hexylresorcinol.....	Hexylresorcinol
Injectiones.....	Injections
Injectio Bismuthi et Potassii Tartratis.....	Bismuth and Potassium Tartrate Injection
Injectio Bismuthi Subsalicylatis.....	Bismuth Subsalicylate Injection
Injectio Caffeinae et Sodii Benzoatis.....	Caffeine and Sodium Benzoate Injection
Injectio Calcii Gluconatis.....	Calcium Gluconate Injection
Injectio Dextrosi.....	Dextrose Injection
Injectio Dextrosi et Sodii Chloridi.....	Dextrose and Sodium Chloride Injection
Injectio Digitalis.....	Digitalis Injection
Injectio Emetinae Hydrochloridi.....	Emetine Hydrochloride Injection
Injectio Epinephrinae Hydrochloridi.....	Epinephrine Hydrochloride Injection
Injectio Hydrargyri Salicylatis.....	Mercuric Salicylate Injection
Injectio Mercuraphyllinae.....	Mercuraphylline Injection
Injectio Mersalylis et Theophyllinae.....	Mersalyl and Theophylline Injection
Injectio Neostigminae Methylsulfatis.....	Neostigmine Methylsulfate Injection
Injectio Ouabaini.....	Ouabain Injection
Injectio Phenolsulfonphthaleini.....	Phenolsulfonphthalein Injection
Injectio Picrotoxini.....	Picrotoxin Injection
Injectio Quininae Hydrochloridi et Æthylis Carbamatis.....	Quinine Hydrochloride and Ethyl Carbamate Injection
Injectio Strophanthini.....	Strophanthin Injection
Injectio Sulfobromophthaleini Sodici.....	Sulfobromophthalein Sodium Injection
Injectio Theophyllinae Æthylenediamini- cæ.....	Theophylline Ethylenediamine Injection
Ligamentum Carbasi Absorbens.....	Gauze Bandage
Liquor Amaranthi.....	Solution of Amaranth
Liquor Chloridorum Trium Isotonicus.....	Isotonic Solution of Three Chlorides
Liquor Chloroazodini.....	Solution of Chloroazodin
Liquor Iodi.....	Solution of Iodine
Liquor Sodii Citratis Anticoagulans.....	Anticoagulant Solution of Sodium Citrate
Liquor Tribromoæthanolis.....	Solution of Tribromoethanol
Magnesii Trisilicas.....	Magnesium Trisilicate
Menadionum.....	Menadione
Mersalyl.....	Mersalyl
Nebula Epinephrinae Hydrochloridi.....	Epinephrine Hydrochloride Spray
Neostigminae Bromidum.....	Neostigmine Bromide
Neostigminae Methylsulfas.....	Neostigmine Methylsulfate
Nicotinamidum.....	Nicotinamide
Oleum Hippoglossi.....	Halibut Liver Oil
Ouabainum.....	Ouabain
Pamaquinae Naphthoas.....	Pamaquine Naphthoate
Perpolitiones Oryzæ.....	Rice Polishings
Picrotoxinum.....	Picrotoxin

Plasma Humanum Normale Citratum	Citrated Normal Human Plasma
Potassii Chloridum	Potassium Chloride
Quinacrinæ Hydrochloridum	Quinacrine Hydrochloride
Quininæ Hydrochloridum	Quinine Hydrochloride
Riboflavinum	Riboflavin
Serum Humanum Normale	Normal Human Serum
Serum Immune Morbilli Humanum	Human Measles Immune Serum
Serum Immune Scarlatinæ Humanum	Human Scarlet Fever Immune Serum
Sodii Sulfitis Exsiccatus	Exsiccated Sodium Sulfite
Sulfapyridinum	Sulfapyridine
Sulfapyridinum Sodicum Sterile	Sterile Sulfapyridine Sodium
Sulfarsphenamina	Sulfarsphenamine
Sulfathiazolum	Sulfathiazole
Sulfobromophthaleinum Sodicum	Sulfobromophthalein Sodium
Syrupus Glycyrrhizæ	Syrup of Glycyrrhiza
Tabellæ Acetophenetidini	Acetophenetidin Tablets
Tabellæ Acidi Acetylsalicylici	Acetylsalicylic Acid Tablets
Tabellæ Acidi Ascorbici	Ascorbic Acid Tablets
Tabellæ Acidi Nicotinici	Nicotinic Acid Tablets
Tabellæ Atropinæ Sulfatis	Atropine Sulfate Tablets
Tabellæ Barbitali	Barbital Tablets
Tabellæ Barbitali Sodici	Barbital Sodium Tablets
Tabellæ Cascaræ Sagradæ	Cascara Sagrada Tablets
Tabellæ Chiniofoni	Chiniofon Tablets
Tabellæ Codeinæ Phosphatis	Codeine Phosphate Tablets
Tabellæ Codeinæ Sulfatis	Codeine Sulfate Tablets
Tabellæ Colchicinæ	Colchicine Tablets
Tabellæ Digitalis	Digitalis Tablets
Tabellæ Dihydromorphenoni Hydrochloridi	Dihydromorphenone Hydrochloride Tablets
Tabellæ Ephedrinæ Sulfatis	Ephedrine Sulfate Tablets
Tabellæ Ergonovinæ Maleatis	Ergonovine Maleate Tablets
Tabellæ Ergotaminæ Tartratis	Ergotamine Tartrate Tablets
Tabellæ Extracti Fellis Bovis	Extract of Ox Bile Tablets
Tabellæ Ferri Sulfatis	Ferrous Sulfate Tablets
Tabellæ Magnesii Phosphatis Tribasici	Tribasic Magnesium Phosphate Tablets
Tabellæ Magnesii Trisilicatis	Magnesium Trisilicate Tablets
Tabellæ Menadioni	Menadione Tablets
Tabellæ Methenaminæ	Methenamine Tablets
Tabellæ Morphinæ Sulfatis	Morphine Sulfate Tablets
Tabellæ Neocinchopheni	Neocinchophen Tablets
Tabellæ Neostigminæ Bromidi	Neostigmine Bromide Tablets
Tabellæ Nicotinamidi	Nicotinamide Tablets
Tabellæ Pentobarbitali Sodici	Pentobarbital Sodium Tablets
Tabellæ Phenobarbitali	Phenobarbital Tablets
Tabellæ Phenobarbitali Sodici	Phenobarbital Sodium Tablets
Tabellæ Potassii Chloridi	Potassium Chloride Tablets

Tabellæ Quinacrinæ Hydrochloridi.....	Quinacrine Hydrochloride Tablets
Tabellæ Quinidinæ Sulfatis.....	Quinidine Sulfate Tablets
Tabellæ Quininæ Sulfatis.....	Quinine Sulfate Tablets
Tabellæ Riboflavini.....	Riboflavin Tablets
Tabellæ Saccharini Sodici.....	Saccharin Sodium Tablets
Tabellæ Sodii Nitritis.....	Sodium Nitrite Tablets
Tabellæ Sodii Salicylatis.....	Sodium Salicylate Tablets
Tabellæ Strychninæ Sulfatis.....	Strychnine Sulfate Tablets
Tabellæ Sulfanilamidi.....	Sulfanilamide Tablets
Tabellæ Sulfapyridini.....	Sulfapyridine Tablets
Tabellæ Sulfathiazoli.....	Sulfathiazole Tablets
Tabellæ Theophyllinæ.....	Theophylline Tablets
Tabellæ Theophyllinæ Æthylenediamini- cæ.....	Theophylline Ethylenediamine Tablets
Tabellæ Theophyllinæ et Sodii Acetatis.....	Theophylline and Sodium Acetate Tablets
Tabellæ Thiaminæ Hydrochloridi.....	Thiamine Hydrochloride Tablets
Tabellæ Thyroidei.....	Thyroid Tablets
Tetracainæ Hydrochloridum.....	Tetracaine Hydrochloride
Tetrachloroæthylene.....	Tetrachloroethylene
Theobromina et Sodii Acetas.....	Theobromine and Sodium Acetate
Totaquina.....	Totaquine
Toxoidum Tetanicum.....	Tetanus Toxoid
Tribromoæthanol.....	Tribromoethanol
Trichloroæthylene.....	Trichloroethylene
Unguentum Æthylis Aminobenzoatis.....	Ethyl Aminobenzoate Ointment
Unguentum Flavum.....	Yellow Ointment
Urea.....	Urea

ARTICLES ADDED TO THE U. S. P. XI BY MEANS OF SUPPLEMENTS

Latin Title	English Title
Acidum Ascorbicum.....	Ascorbic Acid
Acidum Mandelicum.....	Mandelic Acid
Acidum Nicotinicum.....	Nicotinic Acid
Calcii Phosphas Tribasicus.....	Tribasic Calcium Phosphate
Chorda Chirurgicæ.....	Surgical Gut
Cyclopropanum.....	Cyclopropane
Injectio Insulini.....	Insulin Injection
Magnesii Phosphas Tribasicus.....	Tribasic Magnesium Phosphate
Methylosanilinæ Chloridum.....	Methylosaniline Chloride
Oleovitamina A.....	Oleovitamin A
Oleovitamina A et D.....	Oleovitamin A and D
Oleovitamina A et D Concentrata.....	Concentrated Oleovitamin A and D
Oleum Cedri Folii.....	Oil of Cedar Leaf
Oleum Persicæ.....	Persic Oil
Pentobarbitalum Solubile.....	Soluble Pentobarbital
Sulfanilamidum.....	Sulfanilamide
Thiaminæ Hydrochloridum.....	Thiamine Hydrochloride

ARTICLES OFFICIAL IN THE U. S. P. XI BUT NOT ADMITTED TO THE U. S. P. XII

Acetum Scillæ
 Acidum Aceticum Dilutum
 Acidum Acetyltannicum
 Acidum Sulfuricum Aromaticum
 Aconitum
 Acriflavina
 Acriflavinae Hydrochloridum
 Æthylhydrocupreinae Hydrochloridum
 Albumini Tannas
 Ammonii Benzoas
 Ammonii Bromidum
 Ammonii Salicylas
 Arseni Triiodidum
 Asafoetida
 Bismuthi Subgallas
 Calcii Bromidum
 Calcii Creosotas
 Cannabis
 Cantharis
 Capsicum
 Carbromalum
 Ceratum Cantharidis
 Cinchona
 Copaiba
 Creosoti Carbonas
 Creosotum
 Dichloramina-T
 Elixir Glycyrrhizæ
 Emplastrum Cantharidis
 Emulsum Asafoetidæ
 Extractum Cannabis
 Extractum Nucis Vomicae
 Ferrum
 Fluidextractum Belladonnae Radicis
 Fluidextractum Cannabis
 Galla
 Guaiacol
 Hydrargyri Iodidum Flavum
 Iodoformum
 Kino
 Liquor Ammonii Acetatis
 Liquor Ferri Chloridi
 Liquor Ferri Tersulfatis

Liquor Sodii Hypochloritis Dilutus
 Magma Ferri Hydroxidi
 Massa Hydrargyri
 Merbaphenum
 Mistura Opii et Glycyrrhizæ Composita
 Oleum Maydis
 Oleum Santali
 Paraffinum
 Paraffinum Chlorinatum
 Pepsinum
 Pilulæ Aloes
 Podophyllum
 Potassii Chloras
 Pulvis Ipecacuanhæ et Opii
 Pulvis Sennæ Compositus
 Pyrogallol
 Quinina
 Resina Podophylli
 Santoninum
 Scilla
 Serpentaria
 Sodii Acetas
 Spiritus Æthylis Nitritus
 Spiritus Chloroformi
 Strychninae Nitras
 Sulfonethylmethanum
 Sulfur Lotum
 Syrupus Ferri Iodidi
 Syrupus Scillæ
 Terebenum
 Theobromina cum Sodii Salicylate
 Tinctura Aconiti
 Tinctura Cantharidis
 Tinctura Capsici
 Tinctura Cinchonæ Composita
 Tinctura Ferri Chloridi
 Tinctura Kino
 Tinctura Scillæ
 Tinctura Valerianæ
 Tinctura Veratri Viridis
 Unguentum Gallæ
 Valeriana
 Veratrum Viride

CHANGES IN OFFICIAL LATIN TITLES

U. S. P. XI

U. S. P. XII

Aqua Ammoniae.....	Liquor Ammoniae Dilutus
Aqua Ammoniae Fortior.....	Liquor Ammoniae Fortis
Barbitalum Solubile.....	Barbitalum Sodicum
Caffeina cum Sodii Benzoate.....	Caffeina et Sodii Benzoas
Erythritylis Tetranitras Dilutus.....	Tabellae Erythritylis Tetranitratiss
Fluoresceinum Solubile.....	Fluoresceinum Sodicum
Glucosum.....	Glucosum Liquidum
Iodophthaleinum Solubile.....	Iodophthaleinum Sodicum
Liquor Acidi Arsenosi.....	Liquor Acidi Arseniosi
*Liquor Epinephrinae Hydrochloridi.....	{ Liquor Epinephrinae Hydrochloridi { Injectio Epinephrinae Hydrochloridi
Liquor Hepatis Purificatus.....	
Liquor Histaminae Phosphatis.....	Injectio Histaminae Phosphatis
Liquor Iodi Compositus.....	Liquor Iodi Fortis
Liquor Parathyroidei.....	Injectio Parathyroidei
Liquor Pituitarii Posterioris.....	Injectio Pituitarii Posterioris
Liquor Sodii Chloridi Physiologicus.....	Liquor Sodii Chloridi Isotonicus
Nitrogenii Monoxidum.....	Oxidum Nitrosum
Oleum Sinapis Volatile.....	Allylis Isothiocyanas
Pentobarbitalum Solubile.....	Pentobarbitalum Sodicum
Phenobarbitalum Solubile.....	Phenobarbitalum Sodicum
Pulvis Chiniofoni.....	Chiniofonum
Saccharinum Solubile.....	Saccharinum Sodicum
Sapo Mollis.....	Sapo Mollis Medicinalis
Stomachus.....	Stomachus Pulveratus
Theophyllina cum Aethylenediamina.....	Theophyllina Aethylenediaminica
Theophyllina cum Sodii Acetate.....	Theophyllina et Sodii Acetas
Toxinum Diphthericum Detoxicatum.....	Toxoidum Diphthericum
Unguentum.....	Unguentum Album

* Liquor Epinephrinae Hydrochloridi was formerly used for oral as well as for intravenous purposes. A non-sterile solution under this title is now retained for oral use, while a sterile solution is recognized under the title Injectio Epinephrinae Hydrochloridi.

CHANGES IN OFFICIAL ENGLISH TITLES

U. S. P. XI

U. S. P. XII

Ammonia Water.....	Diluted Solution of Ammonia
Antipneumococcic Serum.....	Antipneumococcic Serum—Type Specific
Caffeine with Sodium Benzoate.....	Caffeine and Sodium Benzoate
Chiniofon Powder.....	Chiniofon
Compound Solution of Iodine.....	Strong Solution of Iodine
Diluted Erythrityl Tetranitrate.....	Erythrityl Tetranitrate Tablets
Glucose.....	Liquid Glucose
Nitrogen Monoxide.....	Nitrous Oxide
Ointment.....	White Ointment
Physiological Solution of Sodium Chloride.....	Isotonic Solution of Sodium Chloride
Purified Petroleum Benzin.....	Purified Benzin
Purified Solution of Liver.....	Liver Injection
Soft Soap.....	Medicinal Soft Soap
Soluble Barbitol.....	Barbitol Sodium
Soluble Fluorescein.....	Fluorescein Sodium
Soluble Iodophthalein.....	Iodophthalein Sodium
Soluble Pentobarbital.....	Pentobarbital Sodium
Soluble Phenobarbital.....	Phenobarbital Sodium
Soluble Saccharin.....	Saccharin Sodium
Solution of Arsenous Acid.....	Solution of Arsenious Acid
*Solution of Epinephrine Hydrochloride.....	{ Solution of Epinephrine Hydrochloride Epinephrine Hydrochloride Injection
Solution of Histamine Phosphate.....	Histamine Phosphate Injection
Solution of Liver.....	Liver Injection
Solution of Parathyroid.....	Parathyroid Injection
Solution of Posterior Pituitary.....	Posterior Pituitary Injection
Stomach.....	Powdered Stomach
Stronger Ammonia Water.....	Strong Solution of Ammonia
Theophylline with Ethylene Diamine.....	Theophylline Ethylenediamine
Theophylline with Sodium Acetate.....	Theophylline and Sodium Acetate
Volatile Oil of Mustard.....	Allyl Isothiocyanate

* Solution of Epinephrine Hydrochloride was formerly used for oral as well as for intravenous purposes. A non-sterile solution under this title is now retained for oral use, while a sterile solution is recognized under the title Epinephrine Hydrochloride Injection.

GENERAL NOTICES

FOR THE UNITED STATES PHARMACOPŒIA, TWELFTH REVISION

Official—The word “official” used in this revision of the Pharmacopœia is to be considered as synonymous with “pharmacopœial.”

U. S. Pharmacopœial Standards for Medicinal Substances—The standards prescribed in this Pharmacopœia apply solely to the articles therein named when intended for medicinal use and when bought, sold, or dispensed for this purpose. Such articles labeled with official synonyms must comply with the same standards that are demanded for the same articles under official Latin or English titles.

The official standards apply to vegetable and animal drugs as they enter commerce, whether whole, cut, ground, or otherwise prepared for use, with the exception that when used solely for the manufacture or isolation of fixed or volatile oils, alkaloids, glycosides, or other active principles, they may differ from the standards prescribed by the Pharmacopœia.

Official Preparations—*Ingredients*—Official preparations for which working processes are given in the Pharmacopœia, unless exempted in the General Notices or under the individual monograph, are to be made only from the official ingredients named in the pharmacopœial formulas and by the official processes.

Deviation from Manufacturing Directions—In the manufacture of official articles, deviation in detail from the official directions for manufacture is permissible, provided that the finished articles conform to the standards prescribed by the U. S. Pharmacopœia, Twelfth Revision, or by its Supplements, and to those produced by following the official directions. Unless specifically exempted elsewhere in this Pharmacopœia or its Supplements, the strength, quality, and purity of an official article are determined by the definition, description, general description of physical properties, tests, assay methods, and any other data or specifications relating to the article, whether incorporated in the monograph itself or occurring in any general introductory monograph, or in the General Notices or in the chapter on general tests, processes, and apparatus.

Ointments and Cerates—In official *ointments* and *cerates*, which contain yellow or white wax, the proportions of these and of the other fatty

GENERAL NOTICES

substances directed in the official formulas may be varied to maintain a suitable consistence under different climatic conditions, provided that the ratio of active ingredients to the total weight of the ointment or cerate remains the same and that therapeutic effectiveness of the preparation is not changed.

Capsules, Pills and Tablets—In manufacturing tablets and capsules, it is recognized that many physical conditions of substances are encountered which may require special treatment or preparation of the active ingredients in order to provide proper disintegration, rapid solubility, as well as stabilization. For this and similar purposes it is permissible to use diluents, bulking agents, and adhesives, such as starches, lactose, sucrose, and other innocuous materials as a means of attaining these qualities.

It is further recognized that limitations imposed by mechanical equipment used in the manufacture of these products make it necessary to use harmless, inert materials which act as lubricants to prevent capping, sticking, and binding, and to assure uniformity of dosage.

Capsules generally require the use of bulking and lubricating materials to control accurately the varying dosage requirements of medications dispensed in capsules.

In the case of liquids in capsules, no bulking agents or diluents are to be used.

Coatings—A coating may be applied to official *pills, tablets, and capsules*, provided that it will disintegrate in the alimentary tract and that it is composed of harmless ingredients.

Other suitable diluents or excipients standardized in the Pharmacopœia may replace those directed for official pills, provided that they do not alter rates of absorption or pharmacologic behavior.

Permissible Use of Denatured Alcohol—In the manufacture of pharmacopœial extracts in which alcohol is used as a solvent only and does not remain in the finished product, it is permissible to use alcohol denatured by the addition of from 5 to 10 per cent by volume of methanol or acetone in place of ethyl alcohol in accordance with Federal Statutes and Regulations of the Bureau of Internal Revenue, but the extracts so made must be identical with those prepared by the processes in the monographs and must conform to the standards fixed by the tests of the U. S. Pharmacopœia, Twelfth Revision.

Chemical Formulas—Chemical formulas, other than those in the definitions, tests, and assays, are given in this Pharmacopœia for the purpose of information and calculation.

Solubilities—In pharmacopœial monographs, statements in the solubility paragraph are given for information. For further statements concerning solubilities, see page 608.

Official chemicals, when brought into solution, may show slight mechanical impurities, such as fragments of filter paper, fiber, and dust particles, unless excluded by definite tests in the monograph.

Reagents—The reagents designated for use in this Pharmacopœia must conform to the standards established on pages 643 to 763.

Standards for Strength and Purity—The strength of drugs or preparations for which assay processes are provided is to be determined by the official assay processes. When percentage figures are given to indicate the strength, they refer to *percentages by weight* unless otherwise specified in the monograph. Percentage figures without decimals are to be understood as signifying *exactly* the minimum or maximum: thus 99 per cent means 99.00 per cent.

Pharmacopœial tests for the presence of foreign substances are intended to limit such substances to amounts which would be unobjectionable under the conditions in which the medicinal agents are employed.

Physical Constants—In determining the physical constants of official articles, the pharmacopœial methods only are to be used except in specific cases where other methods are permitted. The range given for these constants is inclusive. The details and methods will be found among the general tests.

Concentrations of Solutions for Testing—Such phrases as “(1 in 10),” “(1 in 20),” etc., are understood to mean that 1 part by volume of a liquid is to be diluted with, or 1 part by weight of a solid dissolved in, sufficient of the solvent to make the volume of the finished solution 10 or 20 parts by volume.

Quantities for Assays and Tests—In stating the quantities to be used for assays, an appropriate amount is specified. The word “about” is used to indicate that this need not be the exact quantity specified, but that it should not deviate more than plus or minus 10 per cent. This quantity is then accurately weighed, and the result of the test or assay is to be based upon the exact weight.

Constant Weight—The term “dried to constant weight,” when used in this Pharmacopœia, means that two consecutive weighings do not differ by more than 0.5 mg. per Gm. of substance taken for the determination, the second weighing following an additional hour of drying.

Negligible—The term “negligible,” where used in this Pharmacopœia, means a quantity not exceeding 0.5 mg.

Concentrations of Solutions—Percentage concentrations of solutions are expressed as follows:

Per cent “weight in weight” (w/w) expresses the number of grams of an active constituent in 100 grams of solution.

Per cent “weight in volume” (w/v) expresses the number of grams of an active constituent in 100 cubic centimeters of solution.

Per cent “volume in volume” (v/v) expresses the number of cubic centimeters of an active constituent in 100 cubic centimeters of solution.

When “per cent” is used in prescriptions without qualification, it means: for solutions of solids in liquids, per cent weight in volume; for solutions of liquids in liquids, per cent volume in volume; and for solutions of gases in liquids, per cent weight in volume. For example, a 1 per cent solution is prepared by dissolving 1 gram of a solid or 1 cubic centimeter of a liquid in sufficient of the solvent to make 100 cubic centimeters of the solution. A solution of the same strength may be prepared by apothecaries weight and measure by dissolving 4.5 grains (more accurately 4.5457 grains) of a solid or 4.8 minims of a liquid in sufficient of the solvent to make 1 fluidounce of the solution at 25° C.

In dispensing prescriptions, slight changes in volume owing to variations in room temperature may be disregarded.

Time Limitations—In testing pharmacopœial chemicals for impurities (*chloride, sulfate, etc.*), five minutes shall be allowed for the reaction to be observed unless otherwise specified.

Alcohol Percentage in Preparations—For each preparation containing alcohol, a range of alcohol content is given. All statements of alcohol content are given in percentages, by volume, of C_2H_5OH .

Temperatures—The standard temperature for solubilities, polarimetric determinations, and for the preparation of volumetric solutions is 25° C. Unless specified in the monographs, specific gravities are given for 25° C., and refer to water at the same temperature, weighings being made in air with brass weights.

For refractive indices, viscosities, and optical rotation measurements, temperatures other than 25° C. are directed as special conditions require.

Refrigerator—When a refrigerator is specified for use in this Pharmacopœia, it is intended to indicate a temperature between 2° and 15° C.

Water Bath—When the Pharmacopœia directs the use of a water bath, it is understood that the water shall be boiling unless otherwise specified. When the use of a water bath is directed in a test, assay, or process, a

steam bath or other form of regulated heat, corresponding in temperature to that of a water bath, may be employed.

Specific Gravity—Except where otherwise stated, the specific gravity basis of this Pharmacopœia is $\frac{25^{\circ} \text{ C.}}{25^{\circ} \text{ C.}}$ (apparent), *i. e.*, the ratio of the weight of a substance in air at 25° C. to that of an equal volume of distilled water at the same temperature.

Apparatus—When a container or implement of definite size and shape is recommended in the directions for a test or an assay, it is not obligatory except when volumetric flasks, measuring burettes, or other exact measuring apparatus or classifying or sorting implements are specified.

Reference Standards—To provide a greater degree of uniformity in certain assays, the Board of Trustees of the U. S. Pharmacopœial Convention has provided Reference Standards to be used as controls in such assays, page 607.

Unofficial Methods for Detecting Added Foreign Substances—Inasmuch as the primary object of the Pharmacopœia is to assure the user of official medicinal substances of their identity, strength, quality, and purity, and as it is manifestly impossible to include in each monograph a test for every impurity or adulterant that might be present, it is to be understood that the presence of any added foreign substance, which could not have resulted from the use of the ingredients in an official formula, constitutes a variation from the official standard. The proof of such variation may be based upon the application of recognized scientific methods, whether such methods appear in the Pharmacopœia or not.

Vegetable and Animal Drugs—Vegetable and animal drugs are to be substantially free from insects or other animal life, extraneous animal material, or animal excreta. They are to be free from moldiness, abnormal odor, or sliminess, and show no substantial discoloration, or deterioration due to any cause.

For the protection of vegetable or animal substances from the ravages of insects, it is directed in special cases that they be preserved in suitable containers into which is introduced at intervals a suitable quantity of chloroform, carbon tetrachloride or other suitable fumigant.

In commerce it is not always possible to obtain vegetable drugs in a state of absolute purity, and a limited amount of innocuous, extraneous, or foreign matter adhering to the drug or admixed with it is usually not detrimental. The presence or admixture of any poisonous, dangerous, or noxious foreign substance, however, is not permissible. Foreign

organic matter refers to any part of the plant or plants yielding the drug, except that part or those parts designated as constituting the drug, and to any other plant parts, vegetable tissues, or substances.

In order that vegetable drugs be of a uniform quality and as free as practicable from foreign substances, it is required that in each vegetable drug recognized in this Pharmacopœia the amount of foreign inorganic matter, estimated as *acid-insoluble ash*, be not more than 2 per cent of the weight of the drug unless otherwise specified in the monograph of the drug, and that the amount of foreign organic matter be restricted to the allowable percentage specified in the monograph of the drug. Before vegetable drugs are ground or powdered, all lumps of dirt or other foreign inorganic matter which can be separated by mechanical means must be removed.

For additional information concerning the standards for vegetable and animal drugs, see pages 627 to 633.

The Container—

1. The “*container*” shall be considered to be the object or objects which hold the drug and which are or may be in direct contact with the drug.

2. The closure of the “*container*” shall be considered a part of the “*container*.”

3. The “*container*” shall not interact physically or chemically with the drug which it is holding so as to alter the strength, quality, or purity of the drug beyond the official requirements.

4. A “*well-closed container*” shall protect the contents from extraneous solids or loss of the drug under the ordinary or customary conditions of handling, shipment, storage, or sale.

5. A “*tight container*” shall protect the contents packaged from contamination by extraneous solids or moisture, from loss of the drug, and from efflorescence, deliquescence, or evaporation under the ordinary or customary conditions of handling, shipment, storage, or sale, and it shall be capable of tight reclosure.

6. A “*hermetic container*” shall be impervious to air or any other gas under the ordinary or customary conditions of handling, shipment, storage, or sale.

7. A “*light-resistant container*” is a container which is opaque, or designed to prevent photo-chemical deterioration of the contents beyond the official limits of strength, quality, or purity, under customary conditions of handling, storage, shipment, or sale.

Unless otherwise directed, a light-resistant container shall be composed of a substance which in a thickness of 2 mm. shall not transmit more than 10 per cent of the incident radiation of any wave-length between 2900 and 4500 Angström units, page 570.

If the immediate container in its construction is less than 2 mm. in thickness, the same 10 per cent limit of light transmission shall apply.

If the immediate container in its construction is not light-resistant, it must be provided with an opaque covering, be enclosed in an opaque covering or in an opaque container.

8. A "*cold place*" shall be a storage place having a temperature not exceeding 15° C. (59° F.).

9. The term "*excessive heat*" as used in connection with the storage of drugs shall mean a temperature above 49° C. (120.2° F.).

10. Where necessary, other and more specific indications may be included under individual monographs, as, for example, special statements with regard to the freezing of milk of magnesia, the volatility or inflammability of ether, the melting of ointments, etc.

Storage—Storage requirements in this Pharmacopœia shall not apply to bulk packages from manufacturers or wholesale distributors, when the products are intended for manufacturing or for subsequent repackaging for the dispenser or retail distributor. This exception does not apply to digitalis or ergot, for which there are special storage requirements.

Metric Weights and Measures—The metric system of weights and measures is the official system used in this Pharmacopœia. The units of the metric system are designated by abbreviations, as follows:

M.	= meter	L.	= liter	dg.	= decigram
dm.	= decimeter	dl.	= deciliter	cg.	= centigram
cm.	= centimeter	ml.	= milliliter	mg.	= milligram
mm.	= millimeter	Kg.	= kilogram		
		Gm.	= gram	cc.	= cubic centimeter

In measuring liquids, cylindrical graduates are preferred. Conical graduates, however, if accurately graduated, are deemed suitable for the use of the pharmacist in compounding or dispensing medicines. The bottom of the meniscus is to be used as the level indicating the volume.

Micro-measurements—The term *microgram* is the unit used to designate 0.001 milligram. It is not to be abbreviated.

The term "*micron*" is the unit employed in the microscopic measurement of length. It is equivalent to 0.001 millimeter. Its symbol is μ .

Apothecaries Weights and Measures—The units of this system are designated in prescribing by symbols or abbreviations as follows:

℥	= apothecaries ounce	= 8 drachms	= 480 grains
℥	= drachm	= 3 scruples	= 60 grains
℥	= scruple	= 20 grains	
gr.	= grain		
℥	= pint	= 16 fluidounces	
℥	= fluidounce	= 8 fluidrachms	= 480 minims
℥	= fluidrachm	= 60 minims	
℥	= minim		

In writing prescriptions in the apothecaries system, Roman, not Arabic, numerals are employed, and these are always placed after the symbol or abbreviation, thus: ℥ii; gr. xv.

In metric abbreviations, the numerals precede the abbreviation, and are always written in Arabic characters, thus: 5 Gm.; 2 cc. To distinguish the abbreviation for gram (Gm.) from that for grain (gr.) the former is written with a capital, the latter with a small letter.

Posology—The insertion of doses has been continued in the Twelfth Revision. The recommendation of the Pharmacopœial Convention stated: "It is to be understood that this Convention and the Committee of Revision created by it intend that these doses serve only as a guide to the physician, and that he may exceed the doses given whenever in his judgment this seems advisable."

The doses are given in both the metric and apothecaries systems. The figures may be considered as interchangeable for practical purposes, although they are not exact equivalents. Rounded figures are used in order to assist physicians and pharmacists in using them.

Average Dose—In modern medicine, drugs are given in order to produce certain therapeutic effects. The amount required for this purpose varies with the disease, as well as with the weight, age, and other characteristics of the patient.

The average doses stated in this Pharmacopœia or its Supplements are those which may be expected ordinarily to produce the therapeutic effect for which the ingredient or preparation is most commonly employed. The doses when administered orally are intended for human adults, unless otherwise indicated.

Usually Available Capsules, Tablets, and Injections—The usually available sizes of capsules and tablets and the concentrations of injections listed under the several monographs are not necessarily identical with the "average doses" and are intended solely as information to physicians and pharmacists. The physician can of course prescribe any quantity of the drug needed for a particular patient in the dosage form desired. The metric and apothecaries figures are not exact equivalents and are not to be considered as such in labeling the amount of active ingredient present in the product.

MONOGRAPHS

ON

VEGETABLE AND ANIMAL DRUGS, CHEMICALS, AND PREPARATIONS

ACACIA

Acacia

Acac.—Gum Arabic

Acacia is the dried gummy exudation from the stems and branches of *Acacia Senegal* (Linné) Willdenow, or of some other African species of *acacia* (Fam. *Leguminosæ*).

Acacia yields not more than 1 per cent of water-insoluble residue, not more than 4 per cent of total ash, page 628, not more than 0.5 per cent of acid-insoluble ash, page 629, and not more than 15 per cent of moisture when determined by Method VII, page 629.

Description—

Unground Acacia—In spheroidal tears up to 32 mm. in diameter or in angular fragments; color, white to yellowish white; translucent or somewhat opaque from the presence of numerous minute fissures; very brittle, the fractured surface glassy and occasionally iridescent; almost odorless; taste mucilaginous.

Powdered Acacia—White to yellowish white; in angular microscopic fragments with but slight traces of starch or vegetable tissues present.

Solubility—Acacia is insoluble in alcohol, but almost completely soluble in twice its weight of water at room temperature, the resulting solution flowing readily and being acid to litmus paper.

Identification—Add 0.2 cc. of diluted lead subacetate T.S. to 10 cc. of a 2 per cent cold, aqueous solution of Acacia: a flocculent, or curdy, white precipitate is immediately produced.

Optical rotation—A 10 per cent aqueous solution of Acacia shows but slight laevorotation.

Water-insoluble residue—Dissolve 5 Gm. of powdered or finely ground Acacia in about 100 cc. of distilled water in a 250-cc. Erlenmeyer flask, add 10 cc. of diluted hydrochloric acid, and boil gently for 15 minutes. Filter by suction, while hot, through a filtering crucible, previously tared, wash thoroughly with hot distilled water, dry at 100° C., and weigh. The weight of the residue thus obtained should not exceed 50 mg.

Starch or dextrin—Boil a 2 per cent aqueous solution of Acacia, and cool: it does not give a bluish or reddish color with iodine T.S.

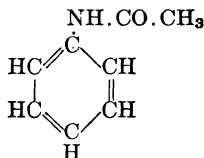
Tannin-bearing gums—Add 0.1 cc. of ferric chloride T.S. to 10 cc. of a 2 per cent aqueous solution of Acacia: no blackish coloration or blackish precipitate is produced.

U. S. P. Product of Acacia—Mucilago Acaciæ.

ACETANILIDUM

Acetanilid

Acetanil.

 C_8H_9ON 

Mol. wt. 135.16

Description—Acetanilid occurs as white, shiny crystals, usually scaly, or as a white, crystalline powder. It is odorless, and is stable in air.

Solubility—One Gm. of Acetanilid dissolves in 190 cc. of water, in 3.5 cc. of alcohol, in 4 cc. of chloroform, in about 17 cc. of ether, and in about 5 cc. of glycerin, at 25° C. One Gm. of Acetanilid dissolves in 20 cc. of boiling water, and in about 0.6 cc. of boiling alcohol.

Melting point—Acetanilid melts between 113° and 115° C., page 595.

Identification—

- A: Boil about 0.1 Gm. of Acetanilid with 5 cc. of sodium hydroxide T.S.: the characteristic odor of aniline becomes noticeable. Add a few drops of chloroform, and again heat the mixture: the disagreeable odor of phenylisocyanide is developed (*Caution: poisonous*).
- B: Boil about 0.1 Gm. of Acetanilid with 2 cc. of hydrochloric acid for about 5 minutes: a clear solution results, which, when mixed with 3 cc. of an aqueous solution of phenol (1 in 20) and 5 cc. of sodium hypochlorite T.S., acquires a brownish red color which becomes deep blue upon the addition of an excess of ammonia T.S.
- C: Add a few drops of bromine T.S. to about 10 cc. of a saturated aqueous solution of Acetanilid: a white, crystalline precipitate of *p*-bromoacetanilid is produced.

Loss on drying—When dried over sulfuric acid for 18 hours, Acetanilid loses not more than 0.5 per cent of its weight.

Ash—Acetanilid yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Acetanilid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—Shake about 1 Gm. of Acetanilid with 20 cc. of distilled water for 2 minutes, and filter: the filtrate is neutral to litmus paper.

Storage—Preserve Acetanilid in well-closed containers.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

ACETONUM

Acetone

Aceton.—Dimethyl Ketone

 C_3H_6O $CH_3.CO.CH_3$

Mol. wt. 58.08

Acetone contains not less than 99 per cent of $(CH_3)_2CO$.

Description—Acetone is a transparent, colorless, mobile, volatile liquid, having a characteristic odor. It is inflammable.

Solubility—Acetone is miscible, without cloudiness, with water, alcohol, ether, chloroform, and with most volatile oils.

Specific gravity—The specific gravity of Acetone is about 0.790 at 25° C.

Boiling point—Acetone boils at about 56° C., but volatilizes even at low temperatures.

Identification—

A: Add 1 cc. of sodium hydroxide T.S. to 1 cc. of an aqueous dilution of Acetone (1 in 200), warm the mixture, and add a few cc. of iodine T.S.: a yellow precipitate of iodoform immediately appears in the liquid.

B: Mix 1 cc. of an aqueous dilution of Acetone (1 in 200) with 5 drops of sodium nitroprusside T.S. and 2 cc. of sodium hydroxide T.S., and add a slight excess of acetic acid: a deep red liquid is produced which develops a violet tint when diluted with several volumes of distilled water.

Non-volatile residue—Evaporate 50 cc. of Acetone in a tared porcelain dish on a water bath, and dry the residue for 2 hours at 100° C.: the weight of the residue does not exceed 2 mg.

Reaction—Acetone, diluted with an equal volume of distilled water, does not affect the color of blue or red litmus paper previously moistened with distilled water.

Readily oxidizable substances—Mix 20 cc. of Acetone with 0.1 cc. of tenth-normal potassium permanganate in a glass-stoppered bottle: the pink color of the mixture does not wholly disappear within 15 minutes.

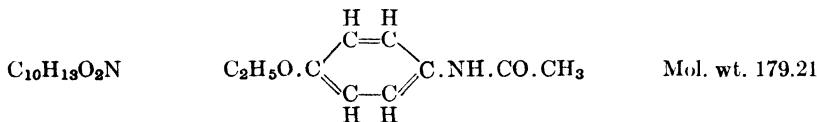
Assay—Determine the exact weight of a glass-stoppered weighing bottle containing 15 cc. of distilled water, add about 1 cc. of Acetone, and again weigh accurately. Transfer the contents of the bottle to a 1000-cc. volumetric flask, rinse the weighing bottle with several portions of distilled water, and add the rinsings to the flask. Fill the flask to the mark with distilled water, and mix the contents thoroughly. Place 25 cc. of normal sodium hydroxide in a 250-cc. glass-stoppered flask, add exactly 25 cc. of the Acetone solution and 35 cc. of tenth-normal iodine, with constant shaking of the flask, and allow the mixture to stand for 15 minutes. Add 26 cc. of normal hydrochloric acid, and at once titrate the residual iodine with tenth-normal sodium thiosulfate, adding starch T.S. as the indicator when the liquid is nearly decolorized. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of the difference, which represents the iodine consumed by the reaction with the Acetone, is equivalent to 0.000968 Gm. of (CH₃)₂CO.

Storage—Preserve Acetone in tight containers, remote from fire.

ACETOPHENETIDINUM

Acetophenetidin

Acetphen.—Acetphenetidin, Phenacetin



Description—Acetophenetidin occurs as white, glistening crystals, usually scaly, or as a fine, white, crystalline powder. It is odorless, and is stable in air.

Solubility—One Gm. of Acetophenetidin dissolves in about 1300 cc. of water, in 15 cc. of alcohol, in 15 cc. of chloroform, and in about 130 cc. of ether, at 25° C. One Gm. of Acetophenetidin dissolves in 85 cc. of boiling water, and in about 3 cc. of boiling alcohol.

Melting point—Acetophenetidin melts between 134° and 136° C., page 595.

Identification—Boil about 0.1 Gm. of Acetophenetidin for 1 minute with 1 cc. of hydrochloric acid, dilute with 10 cc. of distilled water, cool, filter, and add 1 drop of potassium dichromate T.S. to the filtrate: the mixture slowly develops a ruby red color.

Loss on drying—When dried over sulfuric acid for 18 hours, Acetophenetidin loses not more than 0.5 per cent of its weight.

Ash—Acetophenetidin yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Acetophenetidin in 5 cc. of sulfuric acid: the solution has no more color than matching fluid T, page 563.

Reaction—Shake about 1 Gm. of Acetophenetidin with 20 cc. of distilled water for 2 minutes, and filter: the filtrate is neutral to litmus paper.

Acetanilid—Boil 0.5 Gm. of Acetophenetidin with 10 cc. of distilled water for 1 minute, cool, filter, and add bromine T.S. to the filtrate, drop by drop, agitating after each addition until the solution remains permanently yellow: neither turbidity nor precipitation results.

Paraphenetidin—Mix 0.3 Gm. of Acetophenetidin with 1 cc. of alcohol and 1 drop of iodine T.S., add 3 cc. of distilled water, and boil: no red tint is developed.

Storage—Preserve Acetophenetidin in well-closed containers.

U. S. P. Product of Acetophenetidin—Tabellæ Acetophenetidini.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

ACIDUM ACETICUM

Acetic Acid

Acid. Acet.

Acetic Acid is an aqueous solution containing not less than 36 per cent and not more than 37 per cent of $\text{HC}_2\text{H}_3\text{O}_2$.

Description—Acetic Acid is a clear, colorless liquid, having a strong, characteristic odor, and a sharply acid taste.

Solubility—Acetic Acid is miscible with water, with alcohol, and with glycerin.

Specific gravity—Acetic Acid has a specific gravity of about 1.045 at 25°C .

Reaction—Acetic Acid is strongly acid to litmus paper.

Identification—Acetic Acid responds to the tests for acetate, page 587.

Non-volatile residue—Evaporate 20 cc. of Acetic Acid in a tared porcelain dish on a water bath, and dry at 105°C . for 1 hour: the weight of the residue does not exceed 1 mg.

Chloride—Dilute 1 cc. of Acetic Acid with 10 cc. of distilled water, and add 5 drops of silver nitrate T.S.: no opalescence is produced.

Sulfate—Dilute 1 cc. of Acetic Acid with 10 cc. of distilled water, and add 5 drops of barium chloride T.S.: no turbidity is produced.

Heavy metals—Acetic Acid meets the requirements of the *heavy metals* test under *Acidum Aceticum Glaciale*, page 13.

Readily oxidizable substances—Dilute 4 cc. of Acetic Acid in a glass-stoppered flask with 20 cc. of distilled water, and add 0.3 cc. of tenth-normal potassium permanganate: the pink color is not changed to brown at once, and the liquid does not become entirely brown or free from a pink tint in less than one-half minute.

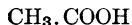
Assay—Place about 6 cc. of Acetic Acid in a tared, glass-stoppered flask, and weigh accurately. Dilute with 40 cc. of distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.06005 Gm. of $\text{HC}_2\text{H}_3\text{O}_2$.

Storage—Preserve Acetic Acid in glass bottles having closures which are not affected by the Acid.

ACIDUM ACETICUM GLACIALE

Glacial Acetic Acid

Acid. Acet. Glac.



Mol. wt. 60.06

Glacial Acetic Acid contains not less than 99.4 per cent of $\text{HC}_2\text{H}_3\text{O}_2$.

Description—Glacial Acetic Acid is a clear, colorless liquid, having a pungent, characteristic odor, and, when well diluted with water, an acid taste.

Solubility—Glacial Acetic Acid is miscible with water, with alcohol, and with glycerin.

Congealing point—Glacial Acetic Acid congeals at a temperature not lower than 15.6°C .

Boiling point—Glacial Acetic Acid boils at about 118°C .

Identification—A mixture of 1 volume of Glacial Acetic Acid with 2 volumes of distilled water responds to the tests for acetate, page 587.

Non-volatile residue—Evaporate 20 cc. of Glacial Acetic Acid in a tared porcelain dish, and dry at 105°C . for 1 hour: the weight of the residue does not exceed 1 mg.

Chloride—Dilute 1 cc. of Glacial Acetic Acid with 20 cc. of distilled water, and add 5 drops of silver nitrate T.S.: no opalescence is produced.

Sulfate—Dilute 1 cc. of Glacial Acetic Acid with 10 cc. of distilled water, and add 1 cc. of barium chloride T.S.: no turbidity is produced.

Heavy metals—Evaporate 5 cc. of Glacial Acetic Acid to dryness in a porcelain dish on a water bath. Warm the residue with 2 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Glacial Acetic Acid is 10 parts per million.

Readily oxidizable substances—Dilute 2 cc. of Glacial Acetic Acid in a glass-stoppered vessel with 10 cc. of distilled water, and add 0.1 cc. of tenth-normal potassium permanganate: the pink color is not changed to brown within 2 hours.

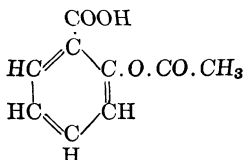
Assay—Measure about 2 cc. of Glacial Acetic Acid into a tared, glass-stoppered flask, and weigh accurately. Add 40 cc. of distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.06005 Gm. of $\text{HC}_2\text{H}_3\text{O}_2$.

Storage—Preserve Glacial Acetic Acid in glass bottles having closures which are not affected by the Acid.

ACIDUM ACETYLSALICYLICUM

Acetylsalicylic Acid

Acid. Acetylsal.—Aspirin



Mol. wt. 180.15

Acetylsalicylic Acid, when dried over sulfuric acid for 5 hours, contains not less than 99.5 per cent of $\text{HC}_7\text{H}_4\text{O}_2 \cdot \text{C}_2\text{H}_3\text{O}_2$.

Description—Acetylsalicylic Acid occurs as white crystals, commonly tabular or needle-like, or as a white, crystalline powder. It is stable in dry air; in moist air it gradually hydrolyzes into salicylic and acetic acids. It is odorless.

Solubility—One Gm. of Acetylsalicylic Acid dissolves in about 300 cc. of water, in 5 cc. of alcohol, in 17 cc. of chloroform, and in from 10 to 15 cc. of ether, at 25° C. It is less soluble in absolute ether. Acetylsalicylic Acid dissolves with decomposition in aqueous solutions of alkali hydroxides and carbonates.

Melting point—Acetylsalicylic Acid has a melting point not below 135° C. when determined by the following method: Reduce the Acid to a No. 100 powder and dry it in a desiccator over sulfuric acid over night. Place enough of the powder in a capillary melting-point tube, having an internal diameter of from 0.8 to 1 mm. and sealed at one end, to form a column of from 1 to 1.5 cm. in length. Tap the end of the tube on a hard surface to make the powder more compact. Place the tube in a bath which has been preheated to 130° C., and warm it at the rate of 3 degrees per minute until the Acid melts.

Identification—

A: Heat Acetylsalicylic Acid with distilled water for several minutes, cool, and add a drop or two of ferric chloride T.S.: a violet red color is produced.

B: Boil about 0.5 Gm. of Acetylsalicylic Acid with 10 cc. of sodium hydroxide T.S. for a few minutes, cool, and add 10 cc. of diluted sulfuric acid: a white precipitate of salicylic acid is produced, and the odor of acetic acid is perceptible. Filter, add to the filtrate 3 cc. of alcohol and 3 cc. of sulfuric acid, and warm: the odor of ethyl acetate becomes noticeable.

Loss on drying—When dried over sulfuric acid for 5 hours, Acetylsalicylic Acid loses not more than 0.5 per cent of its weight.

Ash—Acetylsalicylic Acid yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Acetylsalicylic Acid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid Q, page 563.

Chloride—Heat 1 Gm. of Acetylsalicylic Acid with 40 cc. of distilled water in a small flask until the Acid is dissolved. Add sufficient distilled water to restore the original volume, and thoroughly cool the solution by immersing the flask in ice. Filter the solution, and to 10 cc. of the filtrate add a few drops each of nitric acid and silver nitrate T.S.: no opalescence is produced at once.

Sulfate—To a 10-cc. portion of the filtrate obtained in the test for *chloride* add 2 drops of hydrochloric acid and 5 drops of barium chloride T.S.: no turbidity is produced at once.

Free salicylic acid—Dissolve 0.1 Gm. of Acetylsalicylic Acid in 1 cc. of alcohol, dilute the solution with 48 cc. of cold distilled water, and add at once 1 cc. of a freshly prepared diluted ferric ammonium sulfate solution (made by adding 1 cc. of normal hydrochloric acid to 2 cc. of ferric ammonium sulfate T.S. and diluting with distilled water to 100 cc.). At the end of one-half minute the color of the mixture is not more intense than that similarly observed in a control solution prepared as follows: dissolve 0.1 Gm. of salicylic acid in 1000 cc. of distilled water, and add 1 cc. of glacial acetic acid; mix 1 cc. of this solution with 1 cc. of alcohol and 48 cc. of cold distilled water, and add 1 cc. of the diluted ferric ammonium sulfate solution previously employed.

Heavy metals—Mix 1 Gm. of Acetylsalicylic Acid with 5 cc. of ammonia T.S., and warm gently, with stirring, until a clear solution is obtained and the odor of ammonia is no longer detectable. Cool to room temperature, dilute to 23 cc. with distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Acetylsalicylic Acid is 10 parts per million.

Substances insoluble in sodium carbonate T.S.—A solution of 0.5 Gm. of Acetylsalicylic Acid in 10 cc. of warm sodium carbonate T.S. is clear.

Assay—Place about 1.5 Gm. of Acetylsalicylic Acid, previously dried over sulfuric acid for 5 hours and accurately weighed, in a flask, add 50 cc. of half-normal sodium hydroxide, and boil the mixture gently for 10 minutes. Titrate the excess of sodium hydroxide with half-normal sulfuric acid, using 3 drops of phenolphthalein T.S. as the indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of half-normal sodium hydroxide is equivalent to 0.04504 Gm. of $\text{HC}_7\text{H}_4\text{O}_2 \cdot \text{C}_2\text{H}_3\text{O}_2$.

Storage—Preserve Acetylsalicylic Acid in well-closed containers.

U. S. P. Product of Acetylsalicylic Acid—*Tabellæ Acidi Acetylsalicylici*.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

ACIDUM AMINOACETICUM

Aminoacetic Acid

Acid. Aminoacet.—Glycocol, Glycine



Mol. wt. 75.07

Aminoacetic Acid, when dried at 100° C. for 4 hours, contains not less than 18.4 per cent and not more than 18.8 per cent of N, corresponding to not less than 98.5 per cent of $\text{C}_2\text{H}_5\text{O}_2\text{N}$.

Description—Aminoacetic Acid occurs as a white, odorless, crystalline powder, having a sweetish taste.

Solubility—One Gm. of Aminoacetic Acid dissolves in about 2 cc. of water at 25° C. It is very slightly soluble in alcohol and in ether.

Identification—

- A: To 5 cc. of an aqueous solution of Aminoacetic Acid (1 in 10) add 5 drops of diluted hydrochloric acid and 5 drops of a solution of sodium nitrite (1 in 2). a vigorous evolution of a colorless gas is produced.
- B: Add 1 cc. of ferric chloride T.S. to 2 cc. of an aqueous solution of Aminoacetic Acid (1 in 10): a deep wine color is produced which disappears upon the addition of an excess of diluted hydrochloric acid and reappears upon the addition of an excess of stronger ammonia T.S.
- C: To 2 cc. of an aqueous solution of Aminoacetic Acid (1 in 10) add 1 drop of liquefied phenol and 5 cc. of sodium hypochlorite T.S.: a blue color is produced.

Loss on drying—When dried at 100° C. for 4 hours, Aminoacetic Acid loses not more than 0.2 per cent of its weight.

Ash—Aminoacetic Acid yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Aminoacetic Acid in 5 cc. of sulfuric acid: the solution is colorless, page 563.

Reaction—An aqueous solution of Aminoacetic Acid is only slightly acid to litmus paper.

Chloride—A solution of 1 Gm. of Aminoacetic Acid in distilled water shows no more chloride than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A solution of 3 Gm. of Aminoacetic Acid in distilled water shows no more sulfate than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Dissolve 1 Gm. of Aminoacetic Acid in 15 cc. of distilled water, add 4 cc. of normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Aminoacetic Acid is 20 parts per million.

Hydrolyzable substances—Boil 10 cc. of an aqueous solution of Aminoacetic Acid (1 in 10) for 1 minute, and set aside for 2 hours: the solution appears as clear and as mobile as 10 cc. of the same solution that has not been boiled.

Assay—Determine the nitrogen content of Aminoacetic Acid as directed on page 598, using about 0.15 Gm., previously dried for 4 hours at 100° C. and accurately weighed. Each cc. of tenth-normal hydrochloric acid is equivalent to 0.0014008 Gm. of nitrogen (N). The percentage of nitrogen thus found, multiplied by 5.359, represents the percentage of $\text{C}_2\text{H}_5\text{O}_2\text{N}$.

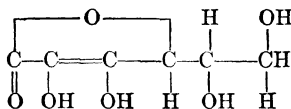
Storage—Preserve Aminoacetic Acid in well-closed containers.

AVERAGE DOSE—Metric, 30 Gm.—Apothecaries, 8 drachms.

ACIDUM ASCORBICUM

Ascorbic Acid

Acid. Ascorb.—Vitamin C

 $C_6H_8O_6$

Mol. wt. 176.12

Ascorbic Acid contains, when dried in a vacuum desiccator over sulfuric acid for 3 hours, not less than 99 per cent of $C_6H_8O_6$.

Description—Ascorbic Acid occurs as white or slightly yellow crystals or powder. It is odorless, and on exposure to light it gradually darkens. In the dry state Ascorbic Acid is reasonably stable in the air, but in aqueous solution it rapidly deteriorates in the presence of air.

Solubility—One Gm. of Ascorbic Acid dissolves in about 3 cc. of water and in about 30 cc. of alcohol; it is insoluble in chloroform, in ether, and in benzene.

Melting point—Ascorbic Acid melts between 189° and 192° C., page 595.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Ascorbic Acid, determined in a solution containing the equivalent of 10 Gm. in 100 cc. of solution, using a 200-mm. tube, is between $+20.5^\circ$ and $+21.5^\circ$, page 601.

Identification—

- A: An aqueous solution of Ascorbic Acid (1 in 50) is acid to litmus paper, and slowly reduces alkaline cupric tartrate T.S. at room temperature but more readily upon heating.
- B: To 1 cc. of an aqueous solution of Ascorbic Acid (1 in 50) add a few drops of sodium nitroprusside T.S., then make the solution alkaline with tenth-normal sodium hydroxide: a blue color is produced immediately.
- C: To 1 cc. of an aqueous solution of Ascorbic Acid (1 in 50), contained in a test tube, add 1 cc. of hydrochloric acid, heat to boiling, and hold over the mouth of the test tube a strip of filter paper freshly dipped in a mixture of equal volumes of aniline and glacial acetic acid: the escaping vapors color the paper red.

Ash—Ascorbic Acid yields not more than 0.1 per cent of ash, page 556.

Heavy metals—Dissolve 1 Gm. of Ascorbic Acid in 20 cc. of distilled water, add 0.5 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Ascorbic Acid is 20 parts per million.

Assay—Dissolve about 0.4 Gm. of Ascorbic Acid, previously dried for 3 hours in a vacuum desiccator over sulfuric acid and accurately weighed, in a mixture of 100 cc. of recently boiled and cooled distilled water and 25 cc. of diluted sulfuric acid, and titrate the solution at once with tenth-normal iodine, adding a few drops of starch T.S. as the end-point is neared. Each cc. of tenth-normal iodine is equivalent to 0.008806 Gm. of $C_6H_8O_6$.

Storage—Preserve Ascorbic Acid in tight, light-resistant containers.

The U. S. P. Ascorbic Acid Reference Standard is described below.*

U. S. P. Product of Ascorbic Acid—Tabellæ Acidi Ascorbici.

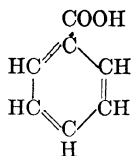
AVERAGE DOSE—Metric, 50 mg.—Apothecaries, $\frac{3}{4}$ grain.

* One United States Pharmacopœial Unit of Ascorbic Acid (Vitamin C) is the Vitamin C activity of 0.05 mg. of the U. S. P. Ascorbic Acid Reference Standard, and is equal in value to one International Unit of Vitamin C as defined and adopted by the Conference of Vitamin Standards of the Permanent Commission on Biological Standardization of the League of Nations in June of 1934. See page 607.

ACIDUM BENZOICUM

Benzoic Acid

Acid. Benz.

 $C_7H_6O_2$ 

Mol. wt. 122.12

Benzoic Acid, dried over sulfuric acid for 5 hours, contains not less than 99.3 per cent of $HC_7H_5O_2$.

Description—Benzoic Acid occurs as white crystals, usually as scales or needles. It is odorless, or it may have a slight odor of benzaldehyde or benzoin. It is somewhat volatile at moderately warm temperatures, and is freely volatile in steam. **Solubility**—One Gm. of Benzoic Acid dissolves in 275 cc. of water, in 3 cc. of alcohol, in 5 cc. of chloroform, and in about 3 cc. of ether. One Gm. of the Acid dissolves in 20 cc. of boiling water, and in 1.5 cc. of boiling alcohol. It is soluble in fixed and in volatile oils and is sparingly soluble in petroleum benzin.

Melting point—Benzoic Acid melts between 121° and 123° C., page 595.

Identification—Benzoic Acid responds to the tests for benzoate, page 558.

Ash—Benzoic Acid yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Benzoic Acid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid Q, page 563.

Chlorinated compounds—Mix 0.5 Gm. of Benzoic Acid and 0.7 Gm. of calcium carbonate with a little distilled water in a crucible, dry the mixture, and incinerate it at a low red heat. Dissolve the residue in 20 cc. of diluted nitric acid, filter, wash the filter and insoluble residue with 15 cc. of distilled water, and add to the filtrate 0.5 cc. of tenth-normal silver nitrate and enough distilled water to make exactly 50 cc. of mixture. Dissolve 0.7 Gm. of the same specimen of calcium carbonate in 20 cc. of diluted nitric acid, filter if necessary, add 0.5 cc. of tenth-normal silver nitrate and enough distilled water to make 50 cc. of liquid. Add to this mixture, from a burette, fiftieth-normal hydrochloric acid, drop by drop, mixing well after each addition, until the turbidity matches that of the Benzoic Acid test mixture: not more than 0.6 cc. of fiftieth-normal hydrochloric acid is required in the control test.

Heavy metals—Suspend 1 Gm. of Benzoic Acid in 15 cc. of distilled water, add 1 drop of phenolphthalein T.S., and follow with ammonia T.S. until the acid is dissolved and the solution is faintly pink. Then add 2 cc. of diluted acetic acid, and dilute with distilled water to 25 cc.: the heavy metals limit, page 586, for Benzoic Acid is 20 parts per million.

Oxidizable impurities—Mix 100 cc. of distilled water with 1.5 cc. of sulfuric acid, heat to boiling, and add tenth-normal potassium permanganate dropwise until the pink color persists for 30 seconds. Dissolve 1.0 Gm. of Benzoic Acid in the hot solution, and titrate with tenth-normal potassium permanganate to a pink color that persists for 15 seconds: not more than 0.5 cc. of tenth-normal potassium permanganate is consumed.

Assay—Dry about 1 Gm. of Benzoic Acid in a desiccator over sulfuric acid for 5 hours, and dissolve about 0.5 Gm. of the dried Acid, accurately weighed, in 25 cc. of diluted alcohol, which has previously been neutralized with tenth-normal sodium hydroxide, using 3 drops of phenolphthalein T.S. as the indicator. Titrate this solution with tenth-normal sodium hydroxide to a pink color. From the volume of tenth-normal sodium hydroxide consumed, subtract one-fifth of the volume of fiftieth-normal hydrochloric acid used in the test for chlorinated compounds.

Each cc. of tenth-normal sodium hydroxide is equivalent to 0.01221 Gm. of $\text{HC}_7\text{H}_5\text{O}_2$.

Storage—Preserve Benzoic Acid in well-closed containers.

U. S. P. Product of Benzoic Acid—*Tinctura Opii Camphorata*.

ACIDUM BORICUM

Boric Acid

Acid. Boric.—*Boracie Acid*

H_3BO_3

Mol. wt. 61.84

Boric Acid, when dried over sulfuric acid for 5 hours, contains not less than 99.5 per cent of H_3BO_3 .

Description—Boric Acid occurs as colorless, odorless scales of a somewhat pearly luster, as crystals or as a white powder, slightly unctuous to the touch. It is stable in air.

Solubility—One Gm. of Boric Acid is soluble in 18 cc. of water, in 18 cc. of alcohol, and in 4 cc. of glycerin, at 25°C . One Gm. is soluble in 4 cc. of boiling water, and in 6 cc. of boiling alcohol.

Identification—Boric Acid responds to the tests for borate, page 588.

Alcohol-insoluble substances—One Gm. of Boric Acid dissolves completely in 10 cc. of boiling alcohol.

Water-insoluble substances—One Gm. of Boric Acid dissolves in 25 cc. of distilled water, producing a clear solution.

Reaction—An aqueous solution of Boric Acid (1 in 50) is slightly acid to litmus paper.

Arsenic—An aqueous solution of Boric Acid meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 1 Gm. of Boric Acid in 23 cc. of distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Boric Acid is 20 parts per million.

Assay—Dry about 2 Gm. of Boric Acid over sulfuric acid for 5 hours, weigh accurately, and dissolve the dried Acid in 100 cc. of a mixture of equal volumes of glycerin and distilled water, previously neutralized to phenolphthalein T.S. Titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Discharge the pink color by the addition of 50 cc. of glycerin, neutralized to phenolphthalein T.S., and again titrate until the pink color reappears. Each cc. of normal sodium hydroxide is equivalent to 0.06184 Gm. of H_3BO_3 .

Storage—Preserve Boric Acid in well-closed containers.

U. S. P. Products of Boric Acid—*Glyceritum Boroglycerini*, *guentum Acidi Borici*.

ACIDUM CITRICUM

Citric Acid

Acid. Cit.

$\text{CH}_2.\text{COOH}$

$\text{C}_6\text{H}_8\text{O}_7.\text{H}_2\text{O}$

$\text{HO}.\text{C}.\text{COOH} .\text{H}_2\text{O}$

Mol. wt. 210.14

$\text{CH}_2.\text{COOH}$

Citric Acid contains not less than 99.7 per cent of $\text{H}_3\text{C}_6\text{H}_5\text{O}_7.\text{H}_2\text{O}$.

Description—Citric Acid occurs as colorless, translucent crystals, or as a white, granular to fine, crystalline powder. It is odorless, has an acid taste, and is efflorescent in dry air.

Solubility—One Gm. of Citric Acid dissolves in 0.5 cc. of water, in 2 cc. of alcohol, and in about 30 cc. of ether, at 25° C.

Identification—An aqueous solution of Citric Acid responds to the tests for citrate, page 589.

Difference from tartaric acid—When slowly ignited, Citric Acid is gradually decomposed without emitting an odor resembling that of burning sugar.

Ash—Citric Acid yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Mix 0.5 Gm. of powdered Citric Acid with 5 cc. of sulfuric acid in a test tube that has been previously rinsed with sulfuric acid, and maintain the temperature of the mixture at 90° C. for 1 hour: the color of the mixture is not darker than that of matching fluid K, page 563.

Reaction—Citric Acid in aqueous solution is acid to litmus paper.

Oxalic acid—Neutralize 10 cc. of an aqueous solution of Citric Acid (1 in 10) with ammonia T.S., add 5 drops of diluted hydrochloric acid, cool, and add 2 cc. of calcium chloride T.S.: no turbidity is produced.

Sulfate—Add 1 cc. of barium chloride T.S. to 10 cc. of an aqueous solution of the Acid (1 in 100), to which has been added 1 drop of hydrochloric acid: no turbidity is produced.

Heavy metals—Dissolve 2 Gm. of Citric Acid in 10 cc. of distilled water, and add 1 drop of phenolphthalein T.S., followed by ammonia T.S. until the solution is faintly pink. Dilute to 23 cc. with distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Citric Acid is 5 parts per million.

Assay—Place about 3 Gm. of Citric Acid in a tared flask and weigh accurately. Dissolve the Acid in 40 cc. of distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.07005 Gm. of $\text{H}_3\text{C}_6\text{H}_5\text{O}_7 \cdot \text{H}_2\text{O}$.

Storage—Preserve Citric Acid in tight containers.

U. S. P. Product of Citric Acid—Syrupus Acidi Citrici.

ACIDUM HYDRIODICUM DILUTUM

Diluted Hydriodic Acid

Acid. Hydriod. Dil.

HI

Mol. wt. 127.93

Diluted Hydriodic Acid is an aqueous solution containing, in each 100 cc., not less than 9.5 Gm. and not more than 10.5 Gm. of HI, and not less than 0.6 Gm. and not more than 1.0 Gm. of $\text{H}_3\text{P}_2\text{O}_2$.

Caution—Diluted Hydriodic Acid must not be dispensed or used in the preparation of other products if it contains free iodine.

Description—Diluted Hydriodic Acid is a colorless or not more than pale yellow, odorless liquid.

Specific gravity—The specific gravity of Diluted Hydriodic Acid is about 1.1 at 25° C.

Identification—Diluted Hydriodic Acid responds to the tests for iodide, page 590.

Residue on ignition—Evaporate 5 cc. of Diluted Hydriodic Acid to dryness on a water bath, and ignite the residue at a dull red heat. Cool, add 5 drops of sulfuric acid, and again ignite to constant weight: the weight of the residue does not exceed 0.10 Gm.

Reaction—Diluted Hydriodic Acid is strongly acid to litmus paper.

Chloride—Mix 0.5 cc. of Diluted Hydriodic Acid with 10 cc. of distilled water, and add 8 cc. of silver nitrate T.S. and 6 cc. of ammonium carbonate T.S. Digest the mixture for 10 minutes on a water bath, cool, and filter; upon the addition of nitric acid, the filtrate shows no more *chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Free iodine—No blue color is produced by the addition of a few drops of starch T.S. to 5 cc. of Diluted Hydriodic Acid.

Sulfate—A 10-cc. portion of Diluted Hydriodic Acid shows no more *sulfate* than corresponds to 1 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—Mix 5 cc. of Diluted Hydriodic Acid with 1 cc. of nitric acid, and evaporate the liquid to dryness on a water bath: the residue meets the requirements of the test for *arsenic*, page 554.

Barium—The addition of 1 cc. of diluted sulfuric acid to 10 cc. of Diluted Hydriodic Acid causes no turbidity.

Heavy metals—To 1.8 cc. (2 Gm.) of Diluted Hydriodic Acid add 5 cc. of distilled water and 1 drop of phenolphthalein T.S.; then add enough ammonia T.S. to give the solution a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Diluted Hydriodic Acid is 10 parts per million.

Limit of hypophosphorous acid—To 5 cc. of Diluted Hydriodic Acid, accurately measured, add 5 cc. of distilled water and 15 cc. of solution of hydrogen peroxide. Allow the mixture to stand for 15 minutes. Heat the mixture on a water bath until all of the iodine has been volatilized and the solution becomes colorless, then add 1 Gm. of ammonium chloride, 50 cc. of distilled water, and 15 cc. of magnesia mixture T.S. Allow the precipitate to settle for a period of 10 minutes, and add 40 cc. of ammonia T.S. Stir the mixture for 10 minutes, and set it aside for 4 hours at room temperature. Filter, and wash the precipitate with a mixture of 1 volume of ammonia T.S. and 3 volumes of distilled water until free from chloride. Dry the residue and ignite it to constant weight. The weight of magnesium pyrophosphate obtained, multiplied by 0.593, indicates its equivalent in $\text{H}_2\text{P}_2\text{O}_7$. If the solution of hydrogen peroxide used in this test contains phosphates, a blank test must be run on the reagents and the proper corrections made for phosphates in the reagents.

Assay for hydriodic acid—Accurately measure 5 cc. of Diluted Hydriodic Acid into a flask, dilute with 20 cc. of distilled water, add 50 cc. of tenth-normal silver nitrate, and shake the mixture well. Then add 5 cc. of nitric acid, and heat the mixture on a water bath until the precipitate has acquired a bright yellow color. Cool, add 2 cc. of ferric ammonium sulfate T.S., and determine the residual silver nitrate by titration with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01279 Gm. of HI.

Storage—Preserve Diluted Hydriodic Acid in tight containers, preferably at a temperature not above 30° C.

U. S. P. Product of Diluted Hydriodic Acid—Syrupus Acidi Hydriodici.

ACIDUM HYDROCHLORICUM

Hydrochloric Acid

Acid. Hydrochlor.

HCl

Mol. wt. 36.47

Hydrochloric Acid is an aqueous solution containing not less than 35 per cent and not more than 38 per cent of HCl.

Description—Hydrochloric Acid is a colorless, fuming liquid having a pungent odor. The fumes and odor of the Acid disappear when it is diluted with 2 volumes of water.

Specific gravity—The specific gravity of Hydrochloric Acid is about 1.18 at 25° C.

Identification—When Hydrochloric Acid is heated with manganese dioxide, chlorine is evolved. Hydrochloric Acid responds to the tests for chloride, page 589.

Residue on ignition—Evaporate 20 cc. of Hydrochloric Acid to dryness, add 2 drops of sulfuric acid, and ignite: not more than 2 mg. of residue remains.

Reaction—Hydrochloric Acid is strongly acid to litmus paper even when highly diluted.

Dilute Hydrochloric Acid with 2 volumes of distilled water and apply the tests which follow for bromide or iodide, free bromine or chlorine, sulfate, sulfite, and arsenic.

Bromide or iodide—Add 1 cc. of chloroform to 10 cc. of the dilution, and cautiously add, a drop at a time with constant agitation, chlorine T.S. which has been diluted with an equal volume of distilled water: the chloroform remains free from even a transient yellow, orange, or violet color.

Free bromine or chlorine—Add 1 cc. of potassium iodide T.S. and 1 cc. of chloroform to 10 cc. of the dilution, and agitate the mixture: the chloroform remains free from any violet coloration for at least 1 minute.

Sulfate—Add 5 drops of barium chloride T.S. to a mixture of 3 cc. of the dilution and 5 cc. of distilled water: neither turbidity nor precipitation appears within 1 hour.

Sulfite—On the completion of the test for sulfate, the further addition to the liquid of 2 drops of tenth-normal iodine produces neither turbidity nor decoloration of the iodine.

Arsenic—A 5-cc. portion of the dilution, further diluted with 12 cc. of distilled water, omitting the treatment with sulfuric and sulfurous acids, meets the requirements of the test for arsenic, page 554.

Heavy metals—To 1.7 cc. (2 Gm.) of Hydrochloric Acid add 10 cc. of distilled water and 1 drop of phenolphthalein T.S. Add ammonia T.S. until the solution assumes a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Hydrochloric Acid is 5 parts per million.

Assay—Tare a glass-stoppered flask containing about 20 cc. of distilled water, add about 3 cc. of Hydrochloric Acid, and reweigh. Dilute with about 25 cc. of distilled water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.03647 Gm. of HCl.

Storage—Preserve Hydrochloric Acid in tight containers.

U. S. P. Product of Hydrochloric Acid—Acidum Hydrochloricum Dilutum.

ACIDUM HYDROCHLORICUM DILUTUM

Diluted Hydrochloric Acid

Acid. Hydrochlor. Dil.

Diluted Hydrochloric Acid is an aqueous solution containing, in each 100 cc., not less than 9.5 Gm. and not more than 10.5 Gm. of HCl.

Diluted Hydrochloric Acid may be prepared as follows:

HYDROCHLORIC ACID..... 236 cc.

DISTILLED WATER, a sufficient quantity,

To make..... 1000 cc.

Mix the ingredients.

Description—Diluted Hydrochloric Acid is a colorless, odorless liquid.

Specific gravity—The specific gravity of Diluted Hydrochloric Acid is about 1.046 at 25° C.

Reaction—Diluted Hydrochloric Acid is strongly acid to litmus paper.

Other tests—Diluted Hydrochloric Acid, without further dilution, conforms to the tests for *identification, residue on ignition, bromide or iodide, free bromine or chlorine, sulfate, sulfite, and arsenic* under *Acidum Hydrochloricum*, page 21.

Heavy metals—To 9.5 cc. (10 Gm.) of Diluted Hydrochloric Acid add 5 cc. of distilled water and 1 drop of phenolphthalein T.S. Add ammonia T.S. until the solution assumes a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Diluted Hydrochloric Acid is 5 parts per million.

Assay—Accurately measure 10 cc. of Diluted Hydrochloric Acid, and dilute with about 20 cc. of distilled water. Titrate the solution with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.03647 Gm. of HCl.

Storage—Preserve Diluted Hydrochloric Acid in tight containers.

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

ACIDUM HYPOPHOSPHOROSUM

Hypophosphorous Acid

Acid. Hypophosph.

HPH_2O_2

Mol. wt. 66.00

Hypophosphorous Acid is an aqueous solution containing not less than 30 per cent and not more than 32 per cent of HPH_2O_2 .

Description—Hypophosphorous Acid is a colorless or slightly yellow, odorless liquid.

Specific gravity—The specific gravity of Hypophosphorous Acid is about 1.13 at 25° C.

Identification—Hypophosphorous Acid responds to the tests for hypophosphite, page 590.

Reaction—Hypophosphorous Acid is acid to litmus paper even when highly diluted.

Hypophosphorous Acid, diluted with 3 volumes of distilled water, meets the requirements of the following tests for arsenic, barium, and oxalate:

Arsenic—Mix 5 cc. of the dilution with 3 cc. of nitric acid and 10 cc. of distilled water, and evaporate the liquid to dryness on a water bath: the residue meets the requirements of the test for *arsenic*, page 554.

Barium—Neutralize 30 cc. of the dilution with ammonia T.S.: the mixture exhibits little or no precipitation. Filter, acidulate 10 cc. of the filtrate with hydrochloric acid, and add 2 cc. of potassium sulfate T.S.: no turbidity is produced.

Oxalate—Another 10-cc. portion of the filtrate obtained in the test for *barium* shows no turbidity upon the addition of 1 cc. of calcium chloride, T.S.

Heavy metals—Place 0.9 cc. (1 Gm.) of Hypophosphorous Acid in a small beaker, and dilute with 3 cc. of distilled water. Add 1 cc. of nitric acid, and evaporate on a steam bath to about 1 cc. Again add 1 cc. of nitric acid, and evaporate on the steam bath. Dissolve the residue in 3 cc. of distilled water, add ammonia T.S. until the solution is distinctly alkaline to litmus paper, then boil gently until the odor of ammonia disappears. Add 2 cc. of diluted acetic acid and 15 cc. of warm distilled water, and filter. Dilute the filtrate with distilled water to 25 cc.: the heavy metals limit, page 586, for Hypophosphorous Acid is 20 parts per million.

Assay—Pour about 7 cc. of Hypophosphorous Acid into a tared, glass-stoppered flask, and weigh accurately. Dilute with about 25 cc. of distilled water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.06604 Gm. of HPH_2O_2 .

Storage—Preserve Hypophosphorous Acid in tight containers.

ACIDUM LACTICUM

Lactic Acid

Acid. Lact.



Mol. wt. 90.08

Lactic Acid is a mixture of $\text{HC}_3\text{H}_5\text{O}_3$ and lactic anhydride equivalent to a total of not less than 85 per cent and not more than 90 per cent of $\text{HC}_3\text{H}_5\text{O}_3$.

Description—Lactic Acid is a colorless, or slightly yellow, nearly odorless, syrupy liquid. It absorbs water on exposure to moist air, and cannot be distilled under normal pressure without decomposition.

Solubility—Lactic Acid is miscible with water, with alcohol, and with ether, but is insoluble in chloroform.

Specific gravity—The specific gravity of Lactic Acid is about 1.206 at 25° C.

Identification—Lactic Acid responds to the tests for lactate, page 590.

Ash—The weight of the ash from 5 cc. of Lactic Acid does not exceed 6 mg., page 556.

Readily carbonizable substances—Carefully superimpose 5 cc. of Lactic Acid upon an equal volume of sulfuric acid in a test tube, and keep the temperature at 15° C.: no dark color develops at the zone of contact of the two liquids within 15 minutes.

Reaction—Lactic Acid is strongly acid to litmus paper.

Chloride—A 10-cc. portion of an aqueous dilution of Lactic Acid (1 in 100) is not rendered turbid by the addition of 2 drops of nitric acid and 1 cc. of silver nitrate T.S.

Citric, oxalic, phosphoric, or tartaric acid—Add 40 cc. of calcium hydroxide T.S. to 10 cc. of an aqueous solution of Lactic Acid (1 in 10), and boil for 2 minutes: no turbidity is produced.

Sulfate—A 10-cc. portion of an aqueous dilution of Lactic Acid (1 in 100) is not rendered turbid by the addition of 2 drops of hydrochloric acid and 1 cc. of barium chloride T.S.

Heavy metals—Dilute 1.7 cc. (2 Gm.) of Lactic Acid with 10 cc. of distilled water, and add 1 drop of phenolphthalein T.S., followed by ammonia T.S. until the solution is faintly pink. Add 2.5 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Lactic Acid is 10 parts per million.

Sugars—Add 5 drops of Lactic Acid to 10 cc. of hot alkaline cupric tartrate T.S.: no red precipitate is produced.

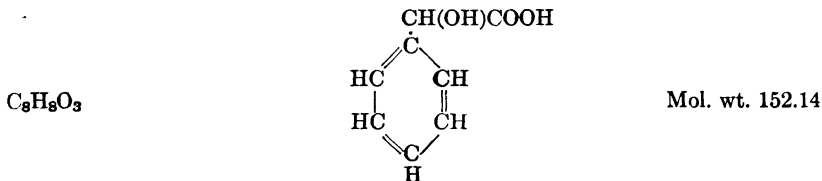
Assay—Add 50 cc. of normal sodium hydroxide to about 2.5 cc. of Lactic Acid, accurately weighed in a tared 250-cc. flask, and boil the mixture for 20 minutes. Titrate the excess of alkali in the hot solution with normal sulfuric acid, using phenolphthalein T.S. as the indicator. Perform a blank test with the same quantities

of the same reagents and in the same manner, and make any necessary correction. Each cc. of normal sodium hydroxide is equivalent to 0.09008 Gm. of $\text{HC}_3\text{H}_5\text{O}_3$.
Storage—Preserve Lactic Acid in tight containers.

ACIDUM MANDELICUM

Mandelic Acid

Acid. Mandel.—Racemic Mandelic Acid



Mandelic Acid, when dried over sulfuric acid for 18 hours, contains not less than 99 per cent of $\text{HC}_8\text{H}_7\text{O}_3$.

Description—Mandelic Acid occurs as white crystals or as a crystalline powder. It is odorless or has a slight, aromatic odor, and gradually darkens and decomposes on exposure to light.

Solubility—One Gm. of Mandelic Acid dissolves in about 6.5 cc. of water at 25° C. It is freely soluble in alcohol and in ether.

Melting point—Mandelic Acid melts between 118° and 120° C., page 595.

Identification—

A: To 2 cc. of an aqueous solution of Mandelic Acid (1 in 20) add 3 cc. of potassium dichromate T.S. followed by 5 cc. of sulfuric acid: the odor of benzaldehyde becomes apparent.

B: Dissolve about 0.2 Gm. of Mandelic Acid in 2 cc. of distilled water, add 5 cc. of sulfuric acid, and agitate gently, then add 10 cc. more of sulfuric acid, and heat gently: a purple color develops and a faint odor of benzaldehyde becomes apparent.

Loss on drying—When dried over sulfuric acid for 18 hours, Mandelic Acid loses not more than 1 per cent of its weight.

Ash—Mandelic Acid yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Mandelic Acid (1 in 20) is acid to litmus paper.

Chloride—Dissolve 1 Gm. of Mandelic Acid in 10 cc. of warm distilled water, and gradually add 0.5 Gm. of reagent sodium carbonate. Evaporate the solution to dryness in a crucible or dish, and incinerate the mass at a low red heat. Cool, break up the charred mass with a glass rod, and add 20 cc. of diluted nitric acid. Stir gently for 5 minutes, filter into a 50-cc. Nessler tube, wash the vessel and the filter, and dilute with distilled water to a volume of 50 cc. Add 1 cc. of silver nitrate T.S., and mix well: the turbidity produced is not greater than that produced in a control test to which 0.15 cc. of fiftieth-normal hydrochloric acid has been added.

Heavy metals—Dissolve 1 Gm. of Mandelic Acid in sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Mandelic Acid is 20 parts per million.

Assay—Dry about 1 Gm. of Mandelic Acid in a desiccator over sulfuric acid for 18 hours, dissolve about 0.5 Gm. of the dried acid, accurately weighed, in 50 cc. of recently boiled and cooled distilled water, and titrate with tenth-normal sodium

hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.01521 Gm. of $\text{HC}_8\text{H}_7\text{O}_3$.

Storage—Preserve Mandelic Acid in well-closed, light-resistant containers.

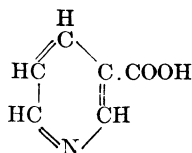
AVERAGE DOSE—Metric, 3 Gm.—Apothecaries, 45 grains.

ACIDUM NICOTINICUM

Nicotinic Acid

Acid. Nicotin.—Niacin

$\text{C}_6\text{H}_5\text{O}_2\text{N}$



Mol. wt. 123.11

Nicotinic Acid, when dried over sulfuric acid for 3 hours, contains not less than 99.5 per cent of $\text{HC}_6\text{H}_4\text{O}_2\text{N}$.

Description—Nicotinic Acid occurs as white crystals or as a crystalline powder. It is odorless or it may have a slight odor.

Solubility—One Gm. of Nicotinic Acid dissolves in 60 cc. of water at 25°C . It is freely soluble in boiling water and in boiling alcohol, and also in aqueous solutions of alkali hydroxides and carbonates, but is almost insoluble in ether.

Melting point—Nicotinic Acid melts between 234° and 237°C ., page 595.

Identification—

A: Triturate Nicotinic Acid with twice its weight of 2,4-dinitrochlorobenzene. Gently heat about 10 mg. of the mixture in a test tube until melted, and continue the heating for a few seconds longer. Cool, and add 3 cc. of alcoholic potassium hydroxide T.S.: a deep red to deep wine red color is produced.

B: Dissolve about 50 mg. of Nicotinic Acid in 20 cc. of distilled water, neutralize to litmus paper with tenth-normal sodium hydroxide, and then add 3 cc. of cupric sulfate T.S.: a blue precipitate gradually forms.

Loss on drying—When dried over sulfuric acid for 3 hours, Nicotinic Acid loses not more than 1 per cent of its weight.

Ash—Nicotinic Acid yields not more than 0.05 per cent of ash, page 556.

Chloride—One-half Gm. of Nicotinic Acid contains no more *chloride* than corresponds to 0.15 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—One-half Gm. of Nicotinic Acid contains no more *sulfate* than corresponds to 0.1 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Mix 1 Gm. of Nicotinic Acid with 1.5 cc. of diluted hydrochloric acid, dilute to 25 cc. with distilled water, heat gently until solution is complete, and cool to room temperature: the heavy metals limit, page 586, for Nicotinic Acid is 20 parts per million.

Assay—Dry about 0.3 Gm. of Nicotinic Acid over sulfuric acid for 3 hours, weigh accurately, dissolve it in about 50 cc. of recently boiled and cooled distilled water, add a few drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.01231 Gm. of $\text{HC}_6\text{H}_4\text{O}_2\text{N}$.

Storage—Preserve Nicotinic Acid in well-closed containers.

U. S. P. Product of Nicotinic Acid—Tabellæ Acidi Nicotini.

AVERAGE DOSE—Metric, 25 mg.—Apothecaries, $\frac{3}{8}$ grain.

ACIDUM NITRICUM

Nitric Acid

Acid. Nitric.



Mol. wt. 63.02

Nitric Acid contains not less than 67 per cent and not more than 71 per cent of HNO_3 .

Description—Nitric Acid is a fuming liquid, very caustic and corrosive and having a characteristic, highly irritating odor. It boils at about 120°C .

Specific gravity—The specific gravity of Nitric Acid is about 1.41 at 25°C .

Identification—

A: Nitric Acid responds to the tests for nitrate, page 591.

B: Nitric Acid acts upon copper, mercury, silver, and many other metals with the evolution of brownish red fumes.

C: Nitric Acid stains woolen fabrics and animal tissues a bright yellow.

Residue on ignition—Evaporate 30 cc. of Nitric Acid in a tared platinum or porcelain dish, add 2 drops of sulfuric acid, and ignite: not more than 2 mg. of residue remains.

Reaction—Nitric Acid is strongly acid to litmus paper even when highly diluted.

Arsenic—The residue remaining from the evaporation of 0.5 cc. of Nitric Acid to dryness on a water bath meets the requirements of the test for *arsenic*, page 554.

Chloride—Dilute Nitric Acid with 10 volumes of distilled water. To 10 cc. of this dilution, add 1 cc. of silver nitrate T.S.: no opalescence is produced.

Sulfate—To another 10-cc. portion of the 1 to 10 dilution, add 5 drops of barium chloride T.S.: no turbidity is produced.

Heavy metals—Evaporate 1.5 cc. (2 Gm.) of Nitric Acid to dryness on a water bath.

Dissolve the residue in 2 cc. of diluted acetic acid, and add distilled water to make 25 cc.: the heavy metals limit, page 586, for Nitric Acid is 10 parts per million.

Assay—Weigh accurately about 2 cc. of Nitric Acid in a tared, glass-stoppered flask.

Dilute with 25 cc. of distilled water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.06302 Gm. of HNO_3 .

Storage—Preserve Nitric Acid in tight containers.

ACIDUM OLEICUM

Oleic Acid

Acid. Oleic.



Mol. wt. 282.45

Oleic Acid is a liquid acid obtained from tallow and other fats, and consists chiefly of $\text{CH}_3(\text{CH}_2)_7\text{CH}:\text{CH}(\text{CH}_2)_7\text{COOH}$.

Description—Oleic Acid is a pale yellow or brownish yellow, oily liquid. It has a peculiar, lard-like odor and taste. On exposure to air it gradually absorbs oxygen and darkens. When strongly heated in air, Oleic Acid is decomposed with the production of acid vapors.

Solubility—Oleic Acid is almost insoluble in water, but is miscible in all proportions with alcohol, chloroform, ether, and benzene, and with fixed and volatile oils.

Specific gravity—The specific gravity of Oleic Acid is about 0.895 at 25°C .

Congealing temperature—Oleic Acid congeals at a temperature not above 10° C., page 566.

Ash—A 5-cc. portion of Oleic Acid yields not more than 5 mg. of ash, page 556.

Mineral acids—Shake 5 cc. of Oleic Acid with an equal volume of distilled water at a temperature of about 25° C. for 2 minutes, allow the liquids to separate, and filter through a paper filter previously moistened with distilled water: the aqueous liquid is not reddened by the addition of 1 drop of methyl orange T.S.

Iodine value—The iodine value of Oleic Acid is not less than 85 and not more than 95, page 579.

Acid value—The acid value of Oleic Acid is not less than 188 and not more than 203, using about 1 Gm. of Acid, accurately weighed, page 578.

Neutral fat or mineral oil—Boil 1 cc. of Oleic Acid with about 0.5 Gm. of sodium carbonate and 30 cc. of distilled water in a capacious flask: the resulting solution, while hot, is clear or, at most, opalescent.

Storage—Preserve Oleic Acid in tight containers.

ACIDUM PHOSPHORICUM

Phosphoric Acid

Acid. Phosph.

H_3PO_4

Mol. wt. 98.00

Phosphoric Acid contains not less than 85 per cent and not more than 88 per cent of H_3PO_4 .

Description—Phosphoric Acid is a colorless, odorless liquid of a syrupy consistence.

Solubility—Phosphoric Acid is miscible with water and with alcohol.

Specific gravity—The specific gravity of Phosphoric Acid is about 1.71 at 25° C.

Identification—Phosphoric Acid, carefully neutralized with sodium hydroxide T.S., using phenolphthalein T.S. as the indicator, responds to the tests for phosphate, page 592.

Reaction—Phosphoric Acid is strongly acid to litmus paper even when highly diluted.

Dilute Phosphoric Acid with 14 volumes of distilled water and apply the tests which follow for nitrate, phosphorous or hypophosphorous acid, sulfate, and arsenic.

Nitrate—Mix 5 cc. of the dilution with about 0.1 cc. of indigo carmine T.S., then add 5 cc. of sulfuric acid: the blue color should not be discharged in 1 minute.

Phosphorous or hypophosphorous acid—Warm 5 cc. of the dilution gently, and add 2 cc. of silver nitrate T.S.: the mixture does not become brown.

Sulfate—Mix 1 cc. of the dilution with 6 cc. of distilled water, and add 1 cc. of barium chloride T.S.: no precipitate is produced immediately.

Arсенic—A 2-cc. portion of the dilution meets the requirements of the test for arsenic, page 554.

Alkali phosphates—Transfer 1 cc. of Phosphoric Acid to a graduated cylinder, and add 6 cc. of ether and 2 cc. of alcohol: no turbidity appears.

Heavy metals—Dilute 3 cc. (5 Gm.) of Phosphoric Acid with sufficient distilled water to make 100 cc. Mix 10 cc. of this dilution with 5.5 cc. of sodium hydroxide T.S., and add sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Phosphoric Acid is 20 parts per million.

Assay—Weigh accurately about 1 Gm. of Phosphoric Acid in a tared, glass-stoppered flask. Then add about 25 cc. of distilled water, and dissolve 5 Gm. of sodium chloride in the solution. Titrate the solution with normal sodium hydroxide, using 2 drops of phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.04900 Gm. of H_3PO_4 .

Storage—Preserve Phosphoric Acid in tight containers.

U. S. P. Product of Phosphoric Acid—Acidum Phosphoricum Dilutum.

ACIDUM PHOSPHORICUM DILUTUM

Diluted Phosphoric Acid

Acid. Phosph. Dil.

Diluted Phosphoric Acid is an aqueous solution containing, in each 100 cc., not less than 9.5 Gm. and not more than 10.5 Gm. of H_3PO_4 .

Diluted Phosphoric Acid may be prepared as follows:

PHOSPHORIC ACID.....	69 cc.
DISTILLED WATER, a sufficient quantity,	
• To make.....	1000 cc.
Mix the ingredients.	

Description—Diluted Phosphoric Acid is a clear, colorless, odorless liquid.

Specific gravity—The specific gravity of Diluted Phosphoric Acid is about 1.057 at 25°C .

Other tests—Diluted Phosphoric Acid, without further dilution, conforms to the tests for *identification, nitrate, phosphorous or hypophosphorous acid, sulfate, and arsenic*, under *Acidum Phosphoricum*, page 27.

Reaction—Diluted Phosphoric Acid is strongly acid to litmus paper.

Alkali phosphates—Evaporate 20 cc. of Diluted Phosphoric Acid on a water bath to a weight of about 5 Gm. Cool, transfer 2 cc. to a graduated cylinder, and add 6 cc. of ether and 2 cc. of alcohol: no turbidity appears.

Heavy metals—Dilute 9.5 cc. (10 Gm.) of Diluted Phosphoric Acid with about 10 cc. of distilled water, and add 0.6 cc. of sodium hydroxide T.S. and sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Diluted Phosphoric Acid is 5 parts per million.

Assay—Accurately measure 10 cc. of Diluted Phosphoric Acid, add about 15 cc. of distilled water, and dissolve 5 Gm. of sodium chloride in the solution. Titrate the solution with normal sodium hydroxide, using 2 drops of phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.04900 Gm. of H_3PO_4 .

Storage—Preserve Diluted Phosphoric Acid in tight containers.

ACIDUM SALICYLICUM

Salicylic Acid

Acid. Salicyl.—Orthohydroxybenzoic Acid



Mol. wt. 138.12

Salicylic Acid, when dried over sulfuric acid for 5 hours, contains not less than 99.5 per cent of $\text{HC}_7\text{H}_5\text{O}_3$.

Description—Salicylic Acid occurs as white crystals, usually in fine needles, or as a fluffy, white, crystalline powder. It has a sweetish, afterwards acid taste, and is

stable in air. Synthetic Salicylic Acid is white and odorless. When prepared from natural methyl salicylate, Salicylic Acid may have a slightly yellow or pink tint, and a faint, gaultheria-like odor.

Solubility—One Gm. of Salicylic Acid dissolves in 460 cc. of water, in 3 cc. of alcohol, in 45 cc. of chloroform, in 3 cc. of ether, and 135 cc. of benzene, at 25° C. One Gm. of the Acid dissolves in about 15 cc. of boiling water.

Melting point—Salicylic Acid melts between 158° and 160° C., page 595.

Identification—Salicylic Acid responds to the tests for salicylate, page 592.

Ash—Salicylic Acid yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Salicylic Acid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid C, page 563.

Chloride—Heat 1.5 Gm. of Salicylic Acid with 45 cc. of distilled water in a small flask until the Acid is dissolved. Add sufficient distilled water to restore the original volume, and thoroughly cool the solution by immersing the flask in ice. Filter the solution, and to 15 cc. of the filtrate add a few drops each of nitric acid and silver nitrate T.S.: no opalescence is produced.

Sulfate—To a 15-cc. portion of the filtrate obtained in the test for *chloride* add 2 drops of hydrochloric acid and 5 drops of barium chloride T.S.: no turbidity is produced.

Heavy metals—Suspend 1 Gm. of Salicylic Acid in 15 cc. of distilled water, add 1 drop of phenolphthalein T.S., and follow with ammonia T.S. until the acid is dissolved and the solution is faintly pink. Then add 2 cc. of diluted acetic acid, and dilute the distilled water to 25 cc.: the heavy metals limit, page 586, for Salicylic Acid is 20 parts per million.

Coloring matter—Allow a solution of 1 Gm. of Salicylic Acid in 3 cc. of alcohol to evaporate spontaneously in a glass or porcelain dish, protected from dust: synthetic Salicylic Acid yields a white, crystalline residue, while that prepared from natural methyl salicylate yields a white, or not more than slightly yellow, or slightly pink residue.

Phenol—Dissolve 1 Gm. of Salicylic Acid in an excess of cold sodium carbonate T.S., agitate the solution with an equal volume of ether, separate the ethereal layer, and allow it to evaporate spontaneously: the residue, if any, is free from the odor of phenol.

Assay—Dissolve about 0.5 Gm. of Salicylic Acid, previously dried over sulfuric acid for 5 hours and accurately weighed, in 25 cc. of diluted alcohol, which previously has been neutralized with tenth-normal sodium hydroxide, using 3 drops of phenolphthalein T.S. as the indicator. Titrate this solution with tenth-normal sodium hydroxide to a pink color. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.01381 Gm. of $\text{HC}_7\text{H}_5\text{O}_3$.

Storage—Preserve Salicylic Acid in well-closed containers.

ACIDUM STEARICUM

Stearic Acid

Acid. Stearic.

Stearic Acid is a mixture of solid acids obtained from fats, and consists chiefly of stearic acid $[\text{CH}_3(\text{CH}_2)_{16}\text{COOH}]$ and palmitic acid $[\text{CH}_3(\text{CH}_2)_{14}\text{COOH}]$.

Description—Stearic Acid is a hard, white or faintly yellowish, somewhat glossy and crystalline solid, or a white or yellowish white powder. The odor and taste are slight, suggesting tallow.

Solubility—Stearic Acid is almost insoluble in water. One Gm. of the Acid dissolves in about 20 cc. of alcohol, in 2 cc. of chloroform, and in about 3 cc. of ether, at 25° C.

Congelling temperature—Stearic Acid congeals at a temperature not below 54° C., page 566.

Mineral acid—Shake 5 Gm. of melted Stearic Acid with an equal volume of hot distilled water for 2 minutes, cool, and filter through a paper filter: the filtrate is not reddened by the addition of 1 drop of methyl orange T.S.

Iodine value—The iodine value of Stearic Acid is not more than 4, page 579.

Neutral fat or paraffin—Add 1 Gm. of Stearic Acid and 0.5 Gm. of sodium carbonate to 30 cc. of distilled water in a capacious flask, and boil the mixture: the resulting solution, while hot, is clear or, at most, opalescent.

Storage—Preserve Stearic Acid in well-closed containers.

ACIDUM SULFURICUM

Sulfuric Acid

Acid. Sulfuric.

H_2SO_4

Mol. wt. 98.08

Sulfuric Acid contains not less than 94 per cent and not more than 98 per cent of H_2SO_4 .

Caution—When Sulfuric Acid is mixed with other liquids, it should always be added to the diluent, and great caution should be observed.

Description—Sulfuric Acid is a colorless, odorless liquid of oily consistence. It is very caustic and corrosive. When strongly heated, Sulfuric Acid is vaporized with the evolution of dense, white fumes.

Miscibility—Sulfuric Acid is miscible with water and with alcohol, in either case with the evolution of much heat.

Specific gravity—The specific gravity of Sulfuric Acid is about 1.84 at 25° C.

Identification—

A: Sulfuric Acid responds to the tests for sulfate, page 592.

B: Sulfuric Acid with or without the aid of heat chars sucrose, wood, and many other organic substances.

Non-volatile substances—Evaporate 5 cc. of Sulfuric Acid in a platinum or porcelain dish, and ignite: not more than 1 mg. of residue remains.

Reaction—Sulfuric Acid is strongly acid to litmus paper even when highly diluted.

Sulfuric Acid, diluted with 15 volumes of distilled water, meets the requirements of the following tests for chloride, nitrate, nitrite or sulfite, arsenic, and heavy metals:

Chloride—Silver Nitrate T.S. produces no turbidity in the dilution.

Nitrate—Mix 5 cc. of the dilution with an equal volume of ferrous sulfate T.S., and superimpose the mixture upon Sulfuric Acid: the zone of contact does not assume a brown or brownish red color.

Nitrite or sulfite—A 10-cc. portion of the dilution does not at once discharge the color of 0.1 cc. of tenth-normal potassium permanganate.

Arsenic—A 5-cc. portion of the dilution meets the requirements of the test for arsenic, page 554.

Heavy metals—To 15 cc. of the dilution add ammonia T.S. until the solution is neutral to litmus paper. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sulfuric Acid is 10 parts per million.

Assay—Weigh accurately about 1 cc. of Sulfuric Acid in a tared, glass-stoppered flask. Dilute cautiously with 25 cc. of distilled water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.04904 Gm. of H_2SO_4 .

Storage—Preserve Sulfuric Acid in tight containers.

U. S. P. Product of Sulfuric Acid—Acidum Sulfuricum Dilutum.

ACIDUM SULFURICUM DILUTUM

Diluted Sulfuric Acid

Acid. Sulfuric. Dil.

Diluted Sulfuric Acid is an aqueous solution containing, in each 100 cc., not less than 9.5 Gm. and not more than 10.5 Gm. of H_2SO_4 .

Diluted Sulfuric Acid may be prepared as follows:

SULFURIC ACID.....	57 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Pour the Acid gradually, with constant stirring, into 900 cc. of distilled water, and allow the solution to cool. Add sufficient distilled water to measure 1000 cc. and mix well.

Description—Diluted Sulfuric Acid is a colorless, odorless liquid having a strongly acid taste.

Specific gravity—The specific gravity of Diluted Sulfuric Acid is about 1.064 at 25° C.

Reaction—Diluted Sulfuric Acid is strongly acid to litmus paper.

Other tests—Diluted Sulfuric Acid, without further dilution, meets the requirements of the tests for *chloride, nitrate, arsenic, and heavy metals* under *Acidum Sulfuricum*, page 30.

Assay—Accurately measure 10 cc. of Diluted Sulfuric Acid, and dilute with about 20 cc. of distilled water. Titrate the solution with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.04904 Gm. of H_2SO_4 .

Storage—Preserve Diluted Sulfuric Acid in tight containers.

ACIDUM TANNICUM

Tannic Acid

Acid. Tan.—Gallotannic Acid, Tannin

Tannic Acid is a tannin usually obtained from nutgalls, the excrescences obtained from the young twigs of *Quercus infectoria* Olivier, and other allied species of *Quercus* (Fam. *Fagaceæ*).

Description—Tannic Acid occurs as an amorphous powder, as glistening scales, or as spongy masses, varying in color from yellowish white to light brown. It is odorless or has a faint, characteristic odor, and a strongly astringent taste.

Solubility—Tannic Acid is very soluble in water, in acetone, and in alcohol. It is freely soluble in diluted alcohol but only slightly soluble in dehydrated alcohol. It is almost insoluble in benzene, in chloroform, in ether, and in petroleum benzin. One Gm. of Tannic Acid dissolves in about 1 cc. of warm glycerin.

Identification—

A: The addition of a small quantity of ferric chloride T.S. to an aqueous solution of Tannic Acid produces a bluish black color or precipitate.

B: An aqueous solution of Tannic Acid produces precipitates in aqueous solutions of most of the alkaloidal salts, and also in solutions of albumin, of gelatin, and of starch.

Loss on drying—Tannic Acid loses not more than 12 per cent of its weight when dried for 2 hours at 100° C.

Ash—Tannic Acid yields not more than 0.5 per cent of ash, page 556.

Gum or dextrin—Dissolve 2 Gm. of Tannic Acid in 10 cc. of hot distilled water: the solution is not more than slightly turbid. Cool and filter the solution, and divide it into two equal portions. One portion is not rendered turbid by the addition of 10 cc. of alcohol.

Resinous substances—The other portion of the solution, obtained in the test for gum or dextrin, is not rendered turbid by the addition of 10 cc. of distilled water.

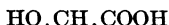
Storage—Preserve Tannic Acid in tight, light-resistant containers.

U. S. P. Products of Tannic Acid—Glyceritum Acidi Tannici, Unguentum Acidi Tannici.

ACIDUM TARTARICUM

Tartaric Acid

Acid. Tart.



Mol. wt. 150.09

Tartaric Acid, when dried over sulfuric acid for 5 hours, contains not less than 99.7 per cent of $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$.

Description—Tartaric Acid occurs as colorless or translucent crystals, or as a white, fine to granular, crystalline powder. It is odorless, has an acid taste, and is stable in air.

Solubility—One Gm. of Tartaric Acid dissolves in 0.8 cc. of water, in about 3 cc. of alcohol at 25° C., and in 0.5 cc. of boiling water.

Identification—Tartaric Acid responds to the tests for tartrate, page 592.

Difference from citric acid—When slowly ignited, Tartaric Acid gradually decomposes, emitting an odor resembling that of burning sugar.

Ash—Tartaric Acid yields not more than 0.05 per cent of ash, page 556.

Reaction—An aqueous solution of Tartaric Acid is acid to litmus paper.

Oxalate—Nearly neutralize 10 cc. of an aqueous solution of Tartaric Acid (1 in 10) with ammonia T.S., and add 10 cc. of calcium sulfate T.S.: no turbidity is produced.

Sulfate—Add 3 drops of hydrochloric acid and 1 cc. of barium chloride T.S. to 10 cc. of an aqueous solution of Tartaric Acid (1 in 100): no turbidity is produced.

Loss on drying—When dried over sulfuric acid for 18 hours, Tartaric Acid loses no more than 0.5 per cent of its weight.

Heavy metals—Dissolve 2 Gm. of Tartaric Acid in 10 cc. of distilled water, and add 1 drop of phenolphthalein T.S., followed by ammonia T.S. until the solution is faintly pink. Dilute to 23 cc. with distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Tartaric Acid is 5 parts per million.

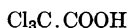
Assay—Place about 2 Gm. of Tartaric Acid, previously dried over sulfuric acid for 5 hours and accurately weighed, in an Erlenmeyer flask. Dissolve it in 40 cc. of distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.07505 Gm. of $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$. Each Gm. of Tartaric Acid, previously dried over sulfuric acid for 5 hours, consumes not less than 13.28 cc. and not more than 13.40 cc. of normal sodium hydroxide.

Storage—Preserve Tartaric Acid in well-closed containers.

ACIDUM TRICHLOROACETICUM

Trichloroacetic Acid

Acid. Trichloroacet.



Mol. wt. 163.40

Trichloroacetic Acid, when dried over sulfuric acid for 18 hours, contains not less than 99 per cent of $\text{HC}_2\text{Cl}_3\text{O}_2$.

Description—Trichloroacetic Acid occurs as colorless, deliquescent crystals, having a slight, characteristic odor. It is highly corrosive to the skin.

Solubility—One Gm. of Trichloroacetic Acid dissolves in about 0.1 cc. of water at 25° C. It is soluble in alcohol and in ether.

Identification—Trichloroacetic Acid, heated with a solution of an alkali hydroxide, is decomposed, with the formation of an alkali carbonate and chloroform. The addition of a few drops of a saturated aqueous solution of aniline to the heated mixture produces the disagreeable odor of phenylisocyanide. (*Caution: poisonous.*)

Ash—Trichloroacetic Acid yields not more than 0.05 per cent of ash, page 556.

Reaction—Trichloroacetic Acid in aqueous solution is acid to litmus paper.

Chloride—One Gm. of Trichloroacetic Acid shows no more *chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—One-half Gm. of Trichloroacetic Acid shows no more *sulfate* than corresponds to 0.4 cc. of fiftieth-normal sulfuric acid, page 626.

Assay—Place about 4 Gm. of Trichloroacetic Acid, previously dried over sulfuric acid for 18 hours, in a tared, glass-stoppered Erlenmeyer flask, and weight accurately. Dissolve the Acid in about 40 cc. of distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.1634 Gm. of $\text{HC}_2\text{Cl}_3\text{O}_2$.

Each Gm. of Trichloroacetic Acid, previously dried over sulfuric acid for 18 hours, consumes not less than 6.06 cc. and not more than 6.12 cc. of normal sodium hydroxide.

Storage—Preserve Trichloroacetic Acid in tight containers, at a temperature not above 30° C.

ADEPS

Lard

Lard is the purified internal fat of the abdomen of the hog, *Sus scrofa* Linné var. *domesticus* Gray (Fam. *Suidæ*).

Description—Lard is a soft, white, unctuous mass, having a faint odor and a bland taste, free from rancidity.

Solubility—Lard is insoluble in water, very slightly soluble in alcohol, and readily soluble in ether and in chloroform.

Melting point—Lard melts between 36° and 42° C., forming a clear liquid from which no aqueous layer separates.

Chloride—Boil 1 Gm. of Lard with 20 cc. of alcohol under a reflux condenser for 10 minutes, cool, filter, and add to the filtrate 5 drops of an alcoholic solution of silver nitrate (1 in 50): the mixture is no more turbid than a mixture of the same volumes of the same reagents with 0.5 cc. of fiftieth-normal hydrochloric acid.

Alkalies—Distilled water boiled with Lard shows no alkaline reaction to litmus paper.

Beef stearin—Dissolve 5 Gm. of Lard in 20 cc. of ether in a test tube, close the tube loosely with purified cotton, and allow it to stand for about 18 hours at a temperature of about 20° C. Collect some of the crystals which have separated at the bottom of the test tube, mount them either in alcohol or in a fixed oil, and examine them under a microscope having a magnifying power of about 200 diameters: the stearin from the Lard crystallizes in the form of flat, rhomboidal plates, terminating obliquely at one end and grouped irregularly. (Beef stearin crystallizes in the form of cylindrical rods or needles with sharp ends and grouped in fan-shaped clusters.)

Cottonseed fats—Agitate in a test tube 5 cc. of melted and filtered Lard, while warm, with 5 cc. of an alcoholic solution of silver nitrate (made by dissolving 0.1 Gm. of silver nitrate in 10 cc. of alcohol and adding 2 drops of nitric acid), and heat this mixture for 5 minutes in a bath of boiling water: the liquid fat acquires no reddish or brown color, nor is any dark color produced at the zone of contact of the hot liquids.

Saponification value—Lard has a saponification value of not less than 195 and not more than 203, page 579.

Iodine value—Lard has an iodine value of not less than 46 and not more than 70, page 579.

Acid value—The free acids in 10 Gm. of Lard require for neutralization not more than 2 cc. of tenth-normal sodium hydroxide, page 578.

Solidification point of fatty acids—The mixed fatty acids obtained from Lard have a solidification point not below 36° and not above 42° C., page 577.

Storage—Preserve Lard in well-closed containers, preferably at a temperature not above 30° C.

U. S. P. Product of Lard—Adeps Benzoinatus.

ADEPS BENZOINATUS

Benzoinated Lard

Adeps Benz.

LARD.....	1000 Gm.
SIAM BENZOIN, in coarse powder.....	10 Gm.
To make about.....	1000 Gm.

Thoroughly mix the benzoin with the lard previously melted on a water bath, cover the container, and keep the mixture at a temperature near, but at no time above, 60° C. for 2 hours. Strain the liquid through muslin, and stir it occasionally while it cools.

In the manufacture of Benzoinated Lard for use in southern latitudes and during the warm season in other localities, 50 Gm. (or more if necessary) of the lard may be replaced with an equal weight of white wax. If wax is added, it must first be melted, then the melted lard added and the mixture stirred until it congeals.

Storage—Preserve Benzoinated Lard in a cool place, in well-closed containers, preferably at a temperature not above 30° C.

ADEPS LANÆ

Wool Fat ✓

Adeps Lan.—Anhydrous Lanolin, Refined Wool Fat

Wool Fat is the purified, anhydrous, fat-like substance from the wool of sheep, *Ovis aries* Linné (Fam. *Bovidæ*).

Description—Wool Fat is a brownish yellow, tenacious, unctuous mass, having not more than a slight odor.

Solubility—Wool fat is insoluble in water, but mixes without separation with about twice its weight of water. It is sparingly soluble in cold alcohol, more soluble in hot alcohol, and freely soluble in ether and in chloroform.

Melting point—The melting point of Wool Fat is between 36° and 42° C.

Loss on drying—When dried to constant weight on a water bath with frequent stirring Wool Fat loses not more than 0.5 per cent of its weight.

Ash—Wool Fat yields not more than 0.1 per cent of ash, page 556.

Free alkalis—Dissolve 2 Gm. of Wool Fat in 10 cc. of ether and add 2 drops of phenolphthalein T.S.: the liquid is not colored red.

Water-soluble acids or alkalis—Warm 10 Gm. of Wool Fat with 50 cc. of distilled water on a water bath, constantly stirring the mixture until the Wool Fat is melted: the fat separates completely on cooling, leaving the aqueous layer nearly clear and neutral to litmus paper.

Chloride—Boil 20 cc. of alcohol with 1 Gm. of Wool Fat under a reflux condenser, cool, filter, and add to the filtrate 5 drops of an alcoholic solution of silver nitrate (1 in 50): the turbidity, if any, is not greater than that produced in the same volumes of the same reagents by 0.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Ammonia—A 10-cc. portion of the aqueous layer obtained in the test for *water-soluble acids or alkalis* emits no ammonia vapors when boiled with 1 cc. of sodium hydroxide T.S.

Glycerin—A 10-cc. portion of the filtered aqueous layer obtained in the test for *water-soluble acids or alkalis* leaves no sweet residue on evaporation.

Soluble oxidizable impurities—A 10-cc. portion of the filtrate obtained in the test for *water-soluble acids or alkalis* does not completely decolorize 0.05 cc. of tenth-normal potassium permanganate within ten minutes.

Petrolatum—Boil 40 cc. of dehydrated alcohol with 0.5 Gm. of Wool Fat: the solution is clear or not more than opalescent.

Acid value—The free acids in 10 Gm. of Wool Fat require for neutralization not more than 2 cc. of tenth-normal sodium hydroxide, page 578.

Iodine value—The iodine value of Wool Fat is not less than 18 and not more than 36, using 0.8 to 0.85 Gm. of the Wool Fat, page 579.

Storage—Preserve Wool Fat in well-closed containers, preferably at a temperature not above 30° C.

ADEPS LANÆ HYDROSUS

Hydrous Wool Fat

Adeps Lan. Hyd.—Lanolin .

Hydrous Wool Fat is wool fat containing not less than 25 per cent and not more than 30 per cent of water.

Description—Hydrous Wool Fat is a yellowish white, ointment-like mass, having not more than a slight odor. Hydrous Wool Fat, heated on a water bath, separates into an upper oily and a lower aqueous layer. When the heating is continued with

frequent stirring until the Hydrous Wool Fat ceases to lose weight, a residue remains, which, when melted, is transparent and when cold is a yellowish, tenacious, unctuous mass completely soluble in ether or chloroform and only sparingly soluble in alcohol.

Solubility—Hydrous Wool Fat is insoluble in water.

Loss on drying—When dried to constant weight on a water bath with frequent stirring Hydrous Wool Fat loses not less than 25 per cent and not more than 30 per cent of its weight.

Reaction—With ether and with chloroform Hydrous Wool Fat yields turbid solutions which are neutral to moistened litmus paper.

Petrolatum—Hydrous Wool Fat deprived of water by drying on a water bath meets the requirements of the test for *petrolatum* under *Adeps Lanæ*, page 35.

Other requirements—Hydrous Wool Fat complies with the tests for *free alkalies*, *water-soluble acids or alkalies*, *chloride*, *ammonia*, *glycerin* and for *acid value*, under *Adeps Lanæ*, page 35, allowance being made for the proportion of water present.

Iodine value—The iodine value of Hydrous Wool Fat, deprived of water by drying on a water bath, is not less than 18 and not more than 36, using 0.8 to 0.85 Gm. of dried hydrous wool fat, page 579.

Storage—Preserve Hydrous Wool Fat in well-closed containers, preferably at a temperature not above 30° C.

ETHER

Ether

Ethyl Ether, Diethyl Ether

$C_4H_{10}O$

$C_2H_5.O.C_2H_5$

Mol. wt. 74.12

Ether contains from 96 per cent to 98 per cent of $(C_2H_5)_2O$, the remainder consisting of alcohol and water.

Caution—Ether to be used for anesthesia must be preserved in tight containers of not more than 3 Kg. capacity and is not to be used for anesthesia if it has been removed from the original container longer than 24 hours.

Description—Ether is a transparent, colorless, mobile liquid, having a characteristic odor, and a burning, sweetish taste. It is highly volatile and inflammable. Its vapor, when mixed with air and ignited, may explode violently. It is slowly oxidized by the action of air, moisture, and light, with the formation of peroxides.

Solubility—Ether dissolves in about 12 times its volume of water at 25° C. with slight contraction of volume. It is miscible with alcohol, benzene, chloroform, purified benzin, and with fixed and volatile oils.

Specific gravity—The specific gravity of Ether is not less than 0.713 and not more than 0.716 at 25° C.

Boiling point—Ether boils at about 35° C.

Residue on evaporation—Allow 50 cc. of Ether to evaporate spontaneous from a tared shallow dish, and dry at 100° C. for 1 hour: the weight of the residue does not exceed 1 mg.

Reaction—The color of blue litmus paper moistened with distilled water is not changed to red when the paper is immersed in Ether for 10 minutes.

Foreign odor—Place 10 cc. of Ether in a clean, dry, evaporating dish, and allow it to evaporate spontaneously to a volume of about 1 cc.: no foreign odor is perceptible. Transfer this residue to a piece of clean, odorless absorbent paper: no foreign odor is perceptible when the last traces of Ether evaporate from the paper.

Aldehyde—Place 20 cc. of Ether in a colorless, glass-stoppered cylinder, and add 1 cc. of a mixture of 1 cc. of alkaline mercuric potassium iodide T.S. with 17 cc. of a saturated aqueous solution of reagent sodium chloride. Stopper the cylinder,

and shake it vigorously for 10 seconds, then set it aside for 1 minute: the aqueous layer shows no turbidity.

Free acid—Place 10 cc. of 80 per cent alcohol in a 50-cc. glass-stoppered flask, add 0.5 cc. of phenolphthalein T.S., and just sufficient fiftieth-normal sodium hydroxide to produce a pink color which persists after shaking the mixture for 30 seconds. Then add 25 cc. of Ether, stopper the flask, mix gently, and again add fiftieth-normal sodium hydroxide until the pink color persists after shaking the mixture for 30 seconds: not more than 0.4 cc. additional fiftieth-normal sodium hydroxide is required to neutralize the Ether.

Peroxide—Shake 10 cc. of Ether occasionally during 1 hour with 1 cc. of a freshly prepared aqueous solution of potassium iodide (1 in 10), in a 25-cc. glass-stoppered cylinder of colorless glass, protected from light: when viewed transversely against a white background, no color is seen in either liquid.

Storage—Preserve Ether in partly filled, tight, light-resistant containers holding not more than 3 Kg., remote from fire. It is recommended that Ether be kept at a temperature which does not exceed 25° C.

ÆTHYLENUM

Ethylene

Æthylen.

C_2H_4

$CH_2=CH_2$

Mol. wt. 28.05

Ethylene contains not less than 99 per cent by volume of C_2H_4 .

Caution—Ethylene is inflammable, and a mixture of it with oxygen or air will explode when brought in contact with a flame or other causes of ignition.

Description—Ethylene is a colorless gas, somewhat lighter than air, and has a slightly sweet odor and taste. A liter of Ethylene at a pressure of 760 mm. and at 0° C. weighs 1.260 Gm.

Solubility—One volume of Ethylene dissolves in about 4 volumes of water at 0° C. and in about 9 volumes of water at 25° C. One volume of it dissolves in about 0.5 volume of alcohol at 25° C. and in about 0.05 volume of ether at 15.5° C.

Identification—

A: Ethylene is slowly soluble in sulfuric acid but is rapidly absorbed by fuming sulfuric acid and concentrated solutions of potassium permanganate.

B: Bubble Ethylene through bromine T.S.: the reagent is decolorized.

Note—Cylinders containing Ethylene must be kept at a temperature between 20° and 30° C. for at least 6 hours before the Ethylene is withdrawn for the following determinations. The gas volumes are to be measured at room temperature and corrected to a pressure of 760 mm. and a temperature of 25° C.

Acids ~~and~~ **alkalies**—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling distilled water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of three color-comparator tubes of clear glass, of approximately the same size and marked "A," "B," "C," respectively. Add 0.2 cc. of hundredth-normal hydrochloric acid to tube "B," and 0.4 cc. of hundredth-normal hydrochloric acid to tube "C." Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Ethylene through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Ethylene through 50 cc. of barium hydroxide T.S. (The test solution must be devoid of turbidity prior to the test.) Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of the gas. The delivery

tube must have an orifice approximately 1 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the barium hydroxide solution. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with the 50 cc. of solution. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution, prepared by dissolving 0.1 Gm. of sodium bicarbonate in 100 cc. of freshly boiled and cooled distilled water, is added to another 50-cc. portion of barium hydroxide T.S. under the prescribed conditions.

Acetylene, aldehyde, hydrogen sulfide, phosphine—Under the conditions prescribed in the test for *carbon dioxide*, pass 1000 cc. of Ethylene through 25 cc. of silver ammonium nitrate T.S.: no turbidity or darkening is produced.

Carbon monoxide—Collect 1000-cc. portions of Ethylene and of carbon monoxide-free air, page 561, separately, in suitable flasks. Add 10 cc. of distilled water to 0.5 cc. of blood, page 660, and mix thoroughly. Immediately add 2.5 cc. of the blood dilution to each flask, stopper, and shake the flasks frequently during 15 minutes. To each flask add 0.04 Gm. of a mixture of equal parts by weight of pyrogallol and tannic acid. Shake thoroughly, and allow the flasks to stand in the dark for 15 minutes. Pour the contents of each flask into a test tube for observation. The solution from the Ethylene being tested shows no pink coloration and matches the gray color produced in the solution from the carbon monoxide-free air, page 561.

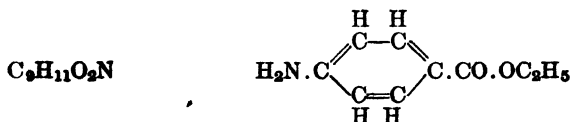
Assay—Place a sufficient quantity of clean mercury in a 100-cc. gas burette or nitrometer provided with a two-way stopcock and a two-way outlet and properly connected with a balancing tube. Connect one of the outlet tubes with a gas pipette of suitable capacity, containing 125 cc. of bromine T.S. By proper manipulation of the balancing tube, draw the bromine T.S. (excluding bubbles of air) through the capillary of the pipette, the outlet tube, and the bore of the stopcock of the burette, and at once close the stopcock. Now by reversing the movement of the balancing tube, completely fill the burette, the other bore of the stopcock, and the other outlet tube with mercury. Draw into the burette about 105 cc. of Ethylene by again lowering the balancing tube. Disconnect the container of gas, and, with the stopcock open, adjust the volume of Ethylene to exactly 100 cc., having the level of the mercury exactly the same in the burette and balancing tube, and close the stopcock. Raise the balancing tube to increase the pressure in the burette, and open the other bore of the stopcock, forcing all of the Ethylene into the gas pipette. Close the stopcock, and rock the gas burette gently for 5 minutes. Open the stopcock, and lower the balancing bulb to draw the gas completely back to the burette, then raise the balancing tube, and force the gas once more into the pipette. Gently rock the pipette until there is no further apparent diminution of the volume of the gas. Draw the residual gas completely into the burette, close the stopcock, remove the bromine pipette, and replace it with one containing potassium hydroxide solution (1 to 1). Force the residual gas into the pipette, rock it gently for 5 minutes, return the gas to the burette, close the bore of the stopcock, and equalize the height of mercury in the two tubes of the burette. Not more than 1 cc. of gas remains.

Storage—Preserve Ethylene in tight containers, remote from fire, and with ample ventilation to the outer air.

ÆTHYLIS AMINOBENZOAS

Ethyl Aminobenzoate

Æthyl. Aminobenz.—Benzocaine



Mol. wt. 165.19

Description—Ethyl Aminobenzoate occurs as small, white crystals, or as a white, crystalline powder. It is odorless, and is stable in air.

Solubility—One Gm. of Ethyl Aminobenzoate dissolves in about 2500 cc. of water, in 5 cc. of alcohol, in 2 cc. of chloroform, in about 4 cc. of ether, and in from 30 to 50 cc. of expressed oil of almond or olive oil, at 25° C. It dissolves in dilute acids.

Melting point—Ethyl Aminobenzoate melts between 88° and 90° C., page 595.

Identification—

A: When Ethyl Aminobenzoate is boiled with an aqueous solution of an alkali hydroxide, alcohol is produced.

B: Dissolve about 20 mg. of Ethyl Aminobenzoate in 10 cc. of distilled water with the aid of a few drops of diluted hydrochloric acid, and add to the solution 5 drops of an aqueous solution of sodium nitrite (1 in 10), followed by 2 cc. of a solution of 0.1 Gm. of betanaphthol in 5 cc. of sodium hydroxide T.S.: an orange-red precipitate is formed in the mixture.

C: An aqueous solution of Ethyl Aminobenzoate (1 in 50), prepared with the aid of a slight excess of diluted hydrochloric acid, yields a precipitate with iodine T.S.

D: To 10 cc. of an aqueous solution of Ethyl Aminobenzoate (1 in 50), prepared with the aid of diluted sulfuric acid, add 3 drops of tenth-normal potassium permanganate: the pink color is discharged.

Loss on drying—When dried over sulfuric acid for 18 hours, Ethyl Aminobenzoate loses not more than 1 per cent of its weight.

Ash—Ethyl Aminobenzoate yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Ethyl Aminobenzoate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Free acid—Dissolve 1 Gm. of Ethyl Aminobenzoate in 10 cc. of neutral alcohol: a clear solution results. Dilute this solution with 10 cc. of distilled water, and add 2 drops of phenolphthalein T.S. and 1 drop of tenth-normal sodium hydroxide: a red color is produced in the mixture.

Chloride—Add a few drops of silver nitrate T.S. to a solution of 0.2 Gm. of Ethyl Aminobenzoate in 5 cc. of alcohol, previously acidulated with a few drops of diluted nitric acid: no immediate turbidity is produced.

Arsenic—Heat a crucible to redness, and add, in small portions, an intimate mixture of 0.2 Gm. of Ethyl Aminobenzoate, about 0.5 Gm. of potassium nitrate and about 0.3 Gm. of anhydrous sodium carbonate. Maintain a red heat until the reaction ceases, then cool the residue, boil it for 5 minutes with 10 cc. of diluted sulfuric acid, filter, and wash the undissolved residue with 10 cc. of distilled water. Evaporate the filtrate and washings until sulfuric acid vapors begin to evolve: the residue, dissolved in 5 cc. of distilled water, meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 1 Gm. of Ethyl Aminobenzoate in 20 cc. of alcohol, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with alcohol: the heavy metals limit, page 586, for Ethyl Aminobenzoate is 10 parts per million.

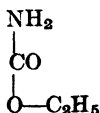
Storage—Preserve Ethyl Aminobenzoate in well-closed containers.

U. S. P. Product of Ethyl Aminobenzoate—Unguentum Æthylis Aminobenzoatis.

ÆTHYLIS CARBAMAS

Ethyl Carbamate

Æthyl. Carbam.—Urethane



Mol. wt. 89.09

Description—Ethyl Carbamate occurs as colorless, columnar crystals or as a white granular powder. It is odorless or nearly so and has a cooling, saline taste.

Solubility—One Gm. of Ethyl Carbamate dissolves in 0.5 cc. of water, in 1 cc. of alcohol, in 3 cc. of glycerin, in about 1 cc. of chloroform, in about 2 cc. of ether, and in about 35 cc. of olive oil, at 25° C.

Melting point—Ethyl Carbamate melts between 48° and 50° C., page 595.

Identification—

A: Add 1 Gm. of Ethyl Carbamate to 5 cc. of sulfuric acid and heat gently; decomposition follows with the evolution of carbon dioxide.

B: Heat 1 Gm. of Ethyl Carbamate with 5 cc. of sodium hydroxide T.S.: ammonia gas is given off, recognizable by its odor.

C: Dissolve about 0.5 Gm. of Ethyl Carbamate in 5 cc. of distilled water, add about 1 Gm. of sodium carbonate and about 10 mg. of iodine and warm the solution: yellow crystals of iodoform separate on cooling.

Loss on drying—When dried for 18 hours over sulfuric acid, Ethyl Carbamate loses not more than 2 per cent of its weight.

Ash—Ethyl Carbamate yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Ethyl Carbamate (1 in 20) is neutral to litmus paper.

Chloride—One-half Gm. of Ethyl Carbamate shows no more *chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Nitrate—Mix 2 cc. of an aqueous solution of Ethyl Carbamate (1 in 20) with 1 cc. of ferrous sulfate T.S., and pour the mixture upon 2 cc. of sulfuric acid, so as to form separate layers: no red or brown zone appears.

Urea—Dissolve about 2 Gm. of Ethyl Carbamate in 2 cc. of distilled water and add 5 cc. of nitric acid: no white precipitate is produced.

Completeness and color of solution—A solution of 1 Gm. of Ethyl Carbamate in 5 cc. of alcohol is practically complete and colorless.

Heavy metals—Dissolve 1 Gm. of Ethyl Carbamate in sufficient distilled water to make 24 cc. and add 1 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 586, for Ethyl Carbamate is 10 parts per million.

Storage—Preserve Ethyl Carbamate in well-closed containers, preferably at a temperature not above 30° C.

U. S. P. Product of Ethyl Carbamate—Injectio Quininae Hydrochloridi et Æthylis Carbamatis.

ÆTHYLIS CHAULMOOGRAS

Ethyl Chaulmoograte

Æthyl. Chaulmoog.

Ethyl Chaulmoograte consists of the ethyl esters of the mixed acids of chaulmoogra oil.

Description—Ethyl Chaulmoograte is a clear, pale yellow liquid, having a slight, fruity odor.

Solubility—Ethyl Chaulmoograte is insoluble in water, but is miscible with alcohol, with chloroform, and with ether.

Specific gravity—Ethyl Chaulmoograte has a specific gravity of about 0.904 at 25° C.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Ethyl Chaulmoograte in chloroform, each 10 cc. of solution containing 5 cc. of Ethyl Chaulmoograte, and using a 100-mm. tube, is not less than +44.5°, page 601.

Saponification value—Ethyl Chaulmoograte has a saponification value of not less than 190 and not more than 196, page 579.

Iodine value—Ethyl Chaulmoograte has an iodine value of not less than 90 and not more than 100, page 579.

Free acid—Dissolve 1 cc. of Ethyl Chaulmoograte in 10 cc. of neutralized alcohol,

and add 2 drops of phenolphthalein T.S.: not more than 0.1 cc. of tenth-normal sodium hydroxide is required for neutralization.

Storage—Preserve Ethyl Chaulmoograte in tight containers.

AVERAGE DOSE—Oral or intramuscular, Metric, 2 cc.—
Apothecaries, 30 minims.

ÆTHYLIS CHLORIDUM

Ethyl Chloride

Æthyl. Chlor.

C_2H_5Cl

$CH_3.CH_2Cl$

Mol. wt. 64.52

Caution—As the vapor is very inflammable, Ethyl Chloride must not be used near flame.

Description—At low temperatures or under increased pressure, Ethyl Chloride is a colorless, mobile, very volatile liquid, boiling between 12° and 13° C. It has a characteristic, ethereal odor, and a burning taste. When Ethyl Chloride is liberated at ordinary room temperature from its sealed container, it vaporizes at once. It burns with a smoky, greenish flame, producing hydrogen chloride.

Solubility—Ethyl Chloride is slightly soluble in water, and dissolves freely in alcohol and in ether.

Specific gravity—Ethyl Chloride has a specific gravity of about 0.921 at 0° C.

Non-volatile residue—Allow 5 cc. of Ethyl Chloride to evaporate spontaneously from a shallow dish: no foreign odor is noticeable while the last portions evaporate, and the weight of the residue is negligible.

Chloride ion—Add a few drops of silver nitrate T.S. to 10 cc. of alcohol, cool to 0° C., and add to the clear liquid about 0.5 cc. of Ethyl Chloride cooled to the same temperature: no turbidity is produced at once.

Acid—Shake 10 cc. of Ethyl Chloride with 10 cc. of distilled water, both previously cooled to 0° C., and allow the supernatant layer of Ethyl Chloride to volatilize spontaneously: the resultant liquid is neutral to litmus paper.

Alcohol—To the aqueous liquid obtained in the test for *acid*, add a few drops of potassium dichromate T.S. and 2 cc. of diluted sulfuric acid, and boil the mixture: no odor of acetaldehyde is developed, and no greenish or purplish color is produced.

Storage—Preserve Ethyl Chloride in tight containers, preferably hermetically sealed, and remote from fire.

ÆTHYLIS OXIDUM

Ethyl Oxide

Æthyl. Oxid.—Solvent Ether

$C_4H_{10}O$

$C_2H_5.O.C_2H_5$

Mol. wt. 74.12

Ethyl Oxide contains from 96 per cent to 98 per cent of $(C_2H_5)_2O$, the remainder consisting of alcohol and water.

Caution—Ethyl Oxide must not be used for anesthesia.

Description—Ethyl Oxide agrees in description and physical properties with *Æther*, page 36.

Aldehyde—Shake 10 cc. of Ethyl Oxide occasionally during 2 hours with 1 cc. of potassium hydroxide T.S. in a glass-stoppered cylinder of colorless glass protected from light: no color develops in either liquid.

Peroxide—Shake 10 cc. of Ethyl Oxide for 1 minute with 1 cc. of a freshly prepared solution of potassium iodide (1 in 10) in a glass-stoppered cylinder of colorless glass: when viewed transversely against a white background, no color is seen in either liquid.

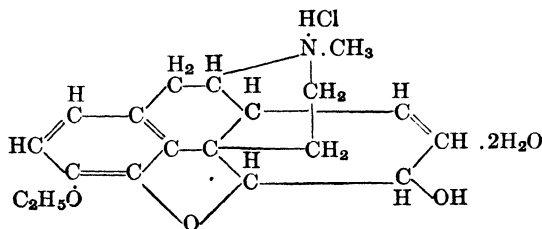
Other requirements—In all other respects Ethyl Oxide has the properties of, and conforms to the tests under *Æther*, page 36.

Storage—Preserve Ethyl Oxide in partly filled, tight, light-resistant containers, remote from fire. It is recommended that Ethyl Oxide be kept at a temperature which does not exceed 25° C.

ÆTHYLMORPHINÆ HYDROCHLORIDUM

Ethylmorphine Hydrochloride

Æthylmorph. Hydrochlor.



$C_{15}H_{23}O_3N.HCl.2H_2O$

Mol. wt. 385.88

Description—Ethylmorphine Hydrochloride occurs as a white, or faintly yellow, microcrystalline powder, and has no odor.

Solubility—One Gm. of Ethylmorphine Hydrochloride dissolves in 10 cc. of water and in 25 cc. of alcohol, at 25° C. It is slightly soluble in ether and in chloroform.

Melting point—Ethylmorphine Hydrochloride melts with decomposition at about 123° C., page 595.

Identification—

A: Add a drop of ferric chloride T.S. to a solution of about 10 mg. of Ethylmorphine Hydrochloride in 10 cc. of sulfuric acid, and warm it on a water bath: the mixture at first becomes green, then deep violet-blue, and after the addition of a drop of nitric acid, deep red.

B: Silver nitrate T.S. produces in an aqueous solution of Ethylmorphine Hydrochloride (1 in 20) a white precipitate which is insoluble in nitric acid.

Loss on drying—Ethylmorphine Hydrochloride loses not more than 10 per cent of its weight when dried for 4 hours at 100° C.

Ash—The ash from 0.2 Gm. of Ethylmorphine Hydrochloride is negligible, page 556.

Reaction—An aqueous solution of Ethylmorphine Hydrochloride (1 in 20) is neutral to litmus paper.

Ammonium compounds—Heat 5 cc. of an aqueous solution of Ethylmorphine Hydrochloride (1 in 20) with 5 cc. of sodium hydroxide T.S. in a test tube in a water bath: moistened red litmus paper held in the escaping vapors does not at once turn blue.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of distilled water, and add 1 cc. of diluted ferric chloride solution (1 volume of ferric chloride T.S. to 9 volumes of distilled water) and 1 cc. of an aqueous solution of Ethylmorphine Hydrochloride (1 in 100): the mixture does not at once become green or blue.

Distinction from codeine hydrochloride—Add 1 cc. of ammonia T.S. to 5 cc. of an

aqueous solution of Ethylmorphine Hydrochloride (1 in 25): a white turbidity is immediately produced in the mixture.

Storage—Preserve Ethylmorphine Hydrochloride in well-closed containers.

AVERAGE DOSE—Metric, 15 mg.—Apothecaries, $\frac{1}{4}$ grain.

AGAR

Agar

Agar-Agar

Agar is the dried mucilaginous substance extracted from *Gelidium corneum* (Hudson) Lamouroux and other species of *Gelidium* (Fam. *Gelidiaceæ*) and closely related algæ (Class *Rhodophyceæ*).

Agar contains not more than 1 per cent of foreign organic matter, page 628, and yields not more than 1 per cent of acid-insoluble ash, page 629, and not more than 20 per cent of moisture when determined by the toluene method IX, page 629.

Description—

Unground Agar—Usually in bundles from 3 to 6 dm. in length, consisting of thin, translucent, membranous, agglutinated pieces 4 to 10 mm. in width; or cut, flaked, or granulated; externally weak yellowish orange to faint yellow, tough when damp, brittle when dry, with a slight odor and a mucilaginous taste.

Histology—Granular and somewhat filamentous; a few fragments of the spicules of sponges and a few frustules of diatoms; in Japanese Agar, the frustules of *Arachnoidiscus Ehrenbergii* Baillon, which are disc-shaped and from 100 to 300 microns in diameter.

Powdered Agar—White to yellowish white or pale buff; in chloral hydrate T.S., fragments transparent, more or less granular, striated, angular, occasionally containing frustules of diatoms.

Solubility—Agar is insoluble in cold water, but slowly soluble in hot water.

Identification—

A: Iodine T.S. colors some of the fragments of Agar bluish black, with some areas reddish to violet.

B: Boil 1 part of Agar for 10 minutes with 100 parts of water, and replace the water lost by evaporation: it yields a stiff jelly upon cooling.

Foreign starch—A solution made by boiling 0.1 Gm. of Agar in 100 cc. of distilled water does not upon cooling produce a blue color upon the addition of iodine T.S.

Gelatin—Dissolve about 1 Gm. of Agar in 100 cc. of boiling distilled water, and allow to cool to about 50° C. To 5 cc. of the solution add 5 cc. of picric acid T.S.: no turbidity appears within 10 minutes.

AVERAGE DOSE—Metric, 4 Gm.—Apothecaries, 1 drachm.

ALCOHOL

Alcohol

Ethanol, Ethyl Alcohol, Spiritus Vini Rectificatus



Mol. wt. 46.07

Alcohol is a liquid containing not less than 92.3 per cent by weight, corresponding to 94.9 per cent by volume, at 15.56° C., of $\text{C}_2\text{H}_5\text{OH}$.

Description—Alcohol is a transparent, colorless, mobile, and volatile liquid. It has a slight, characteristic odor and a burning taste. It is inflammable.

Miscibility—Alcohol is miscible with water without any trace of cloudiness. It is also miscible with ether and with chloroform.

Specific gravity—The specific gravity of Alcohol is not more than 0.816 at 15.56° C. (the U. S. Government standard temperature for alcohol).

Boiling point—Alcohol is readily volatilized even at low temperatures and boils at about 78° C.

Free acid—To 50 cc. of Alcohol in a glass-stoppered flask add 50 cc. of recently boiled distilled water. Add a few drops of phenolphthalein T.S. and titrate with fiftieth-normal sodium hydroxide to a pink color that persists for one-half minute: not more than 0.9 cc. of fiftieth-normal sodium hydroxide is required for neutralization.

Total solids—Evaporate 40 cc. of Alcohol in a platinum or porcelain dish on a water bath, and dry at 100° C.: the weight of the residue does not exceed 1 mg.

Fusel oil constituents—Mix 10 cc. of Alcohol with 5 cc. of distilled water and 1 cc. of glycerin, and allow the mixture to evaporate spontaneously from clean, odorless absorbent paper: no foreign odor is perceptible when the last traces of Alcohol leave the paper.

Amyl alcohol or non-volatile, carbonizable impurities, etc.—Allow 25 cc. of Alcohol to evaporate spontaneously in a porcelain dish, carefully protected from dust, until the surface of the dish is barely moist: no red or brown color is produced upon the addition of a few drops of sulfuric acid.

Aldehydes, organic impurities, etc.—Place 20 cc. of Alcohol in a glass-stoppered cylinder that has been thoroughly cleaned with hydrochloric acid, then rinsed with distilled water and finally with the Alcohol to be tested. Cool the contents to approximately 15° C. and add, by means of a carefully cleaned pipette, 0.1 cc. of tenth-normal potassium permanganate, noting the exact time of addition. Mix at once by inverting the stoppered cylinder, and allow it to stand at 15° C. for 5 minutes: the pink color must not entirely disappear.

Acetone, other ketones, isopropyl alcohol, and tertiary butyl alcohol—A mixture of 1 cc. of Alcohol and 1 cc. of distilled water meets the requirements of the tests for *acetone, other ketones, isopropyl alcohol, and tertiary butyl alcohol* described under *Spiritus Frumenti*, page 428.

Alkaloids and formaldehyde—Alcohol, diluted with an equal volume of water, meets the requirements of the tests for *alkaloids* and *formaldehyde* described under *Spiritus Frumenti*, page 428.

Methanol—Dilute 0.5 cc. of Alcohol to 1 cc. with distilled water: 0.05 cc. of the dilution meets the requirements of the test for *methanol* as described under *Spiritus Frumenti*, page 428.

Storage—Preserve Alcohol in tight containers, remote from fire.

U. S. P. Products of Alcohol—Alcohol Dehydratum, Alcohol Dilutum.

ALCOHOL DEHYDRATUM

Dehydrated Alcohol

Alcohol Dehyd.—Dehydrated Ethanol, “Absolute Alcohol”

Dehydrated Alcohol is a liquid containing not less than 99 per cent by weight of C_2H_5OH .

Description—Dehydrated Alcohol is a transparent, colorless, mobile, and volatile liquid, having a characteristic odor, and a burning taste. It is hygroscopic and inflammable.

Specific gravity—The specific gravity of Dehydrated Alcohol is not more than 0.798 at 15.56° C. (the U. S. Government standard temperature for Alcohol). In other respects Dehydrated Alcohol complies with the tests prescribed under *Alcohol*.

Storage—Preserve Dehydrated Alcohol in tight containers, remote from fire.

ALCOHOL DILUTUM

Diluted Alcohol

Alcohol Dil.—Diluted Ethanol

Diluted Alcohol is a mixture of alcohol and water containing not less than 41 per cent and not more than 42 per cent by weight, corresponding to not less than 48.4 per cent and not more than 49.5 per cent by volume, at 15.56° C., of C_2H_5OH .

Diluted Alcohol may be prepared as follows:

ALCOHOL.....	500 cc.
DISTILLED WATER.....	500 cc.

Measure the alcohol and the distilled water separately at the same temperature, and mix them. If the two liquids are measured at 25° C., the mixture, when cooled to the same temperature, will measure about 970 cc.

Description—Diluted Alcohol is a transparent, colorless, mobile liquid, having a characteristic odor and a burning taste.

Specific gravity—The specific gravity of Diluted Alcohol is not less than 0.935 and not more than 0.937 at 15.56° C. (the U. S. Government standard temperature for Alcohol).

Other tests—In other respects Diluted Alcohol complies with the tests under *Alcohol*, page 44, allowance being made for the difference in alcohol concentration, the boiling point being omitted.

Storage—Preserve Diluted Alcohol in tight containers, remote from fire.

ALLYLIS ISOTHIOCYANAS

Allyl Isothiocyanate

Allyl. Isothiocyan.—Oleum Sinapis Volatile U. S. P. XI, Volatile Oil of Mustard U. S. P. XI, Mustard Oil

 C_3H_5NCS

Mol. wt. 99.15

Allyl Isothiocyanate is the oil obtained by maceration with water and subsequent distillation of the dried ripe seed (free from fixed oil) of *Brassica nigra* (Linné) Koch or of *Brassica juncea* (Linné) Czerniaew (Fam. *Cruciferæ*), or prepared synthetically. It contains not less than 93 per cent of C_3H_5NCS .

Allyl Isothiocyanate must be labeled to indicate whether it was made synthetically or distilled from either of the plants mentioned above.

Caution—Great care must be exercised in smelling Allyl Isothiocyanate. It should be tasted only when highly diluted.

Description—Allyl Isothiocyanate is a colorless or pale yellow, strongly refractive

liquid, having a very pungent, irritating odor, and an acrid taste. It is optically inactive.

Solubility—Allyl Isothiocyanate is miscible with alcohol, with ether, and with carbon disulfide.

Specific gravity—The specific gravity of Allyl Isothiocyanate is not less than 1.013 and not more than 1.020 at 25° C.

Refractive index—The refractive index of Allyl Isothiocyanate is not less than 1.5275 and not more than 1.5310 at 20° C., page 608.

Identification—

A: To 3 cc. of Allyl Isothiocyanate, gradually add 3 cc. of sulfuric acid, keeping the mixture cool, then cautiously agitate the liquid: the mixture evolves sulfur dioxide and retains a light yellow color, but loses the pungent odor of the Oil.

B: To 3 cc. of Allyl Isothiocyanate, contained in a small flask, add 3 cc. of alcohol, then add 6 cc. of ammonia T.S., and warm the mixture to 50° C.: the liquid at first becomes clear, but after standing for some hours, usually deposits crystals of thiosinamine.

Reaction—An alcoholic solution of recently distilled Allyl Isothiocyanate is neutral to moistened litmus paper.

Alcohol, chloroform, petroleum, or fatty oils—Allyl Isothiocyanate distills completely between 148° and 154° C. Both the first and last 10 per cent portions of the distillate have practically the same specific gravity as the original substance.

Phenols—Add 1 drop of ferric chloride T.S. to 1 cc. of Allyl Isothiocyanate diluted with 5 volumes of alcohol: the mixture develops no blue color.

Assay—Dilute about 4 cc. of Allyl Isothiocyanate, accurately weighed, with sufficient alcohol to make exactly 100 cc. of solution. Transfer 5 cc. of this solution by means of a pipette to a 100-cc. measuring flask, and add 50 cc. of tenth-normal silver nitrate and 5 cc. of ammonia T.S. Connect the flask to a reflux condenser, and heat it on a water bath for 1 hour. Allow the liquid to cool to room temperature, disconnect the flask from the condenser, add sufficient distilled water to make the mixture measure 100 cc., mix well, and filter through a dry filter. Reject the first 10 cc. of filtrate. To 50 cc. of the subsequent filtrate, accurately measured, add about 5 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Beginning with the word "Transfer" in the second sentence of the assay, perform a blank test using 5 cc. of alcohol, with the same quantities of reagents and in the same manner and make any necessary correction. Each cc. of tenth-normal silver nitrate is equivalent to 0.004958 Gm. of C_3H_5NCS .

Storage—Preserve Allyl Isothiocyanate in tight containers.

ALOE

Aloe

Aloes

Aloe is the dried juice of the leaves of *Aloe Perryi* Baker, known in commerce as Socotrine Aloe, or of *Aloe barbadensis* Miller (*Aloe vera* "Linné"), known in commerce as Curaçao Aloe, or of *Aloe ferox* Miller and hybrids of this species with *Aloe africana* Miller and *Aloe spicata* Baker, known in commerce as Cape Aloe (Fam. *Liliaceæ*).

Aloe yields not less than 50 per cent of water-soluble extractive, page 632. It contains not more than 12 per cent of moisture when determined by the *Toluene Method*—IX, page 629, and yields not more than 4 per cent of ash, page 628.

Description—

Unground Socotrine Aloe—In reddish black to brownish black, opaque, smooth, and glistening masses; fractured surface somewhat conchoidal; odor characteristic.

Unground Curaçao Aloe—In brownish black, opaque masses; fractured surface uneven, waxy, somewhat resinous; odor characteristic, disagreeable.

Unground Cape Aloe—In dusky to dark brown irregular masses, the surfaces of which are often covered with a yellowish powder; fracture smooth and glassy; odor characteristic, somewhat sour and disagreeable.

The taste of each variety of Aloe is nauseous and very bitter.

Powdered Aloe—Dark yellow, yellowish brown to olive brown; mounted in a bland expressed oil it appears as greenish yellow to reddish brown angular or irregular fragments, the hues of which depend to some extent upon the thickness of the fragments.

Identification—

- A: Powdered Aloe dissolves in nitric acid with effervescence, forming a reddish brown to brown solution.
- B: Intimately mix in a flask or bottle 1 Gm. of finely powdered Aloe with 25 cc. of cold distilled water, shake the mixture occasionally during 2 hours, transfer it to a filter, and wash the filter and residue with sufficient cold distilled water to make the filtrate measure 100 cc.: the color of the filtrate, viewed in the bulb of a 100-cc. volumetric flask, is dark yellow with Socotrine Aloe, dark orange with Curaçao Aloe, and greenish yellow with Cape Aloe. The filtrate darkens on standing.
- C: To 5 cc. of the filtrate obtained in *test B*, add 2 cc. of nitric acid: the mixture is of a yellow color with Socotrine Aloe, a reddish orange color with Curaçao Aloe, and a reddish brown color which changes rapidly to green with Cape Aloe.
- D: To 5 cc. of the filtrate obtained in *test B*, add 45 cc. of distilled water and 20 cc. of an aqueous solution of sodium borate (1 in 20): the mixture develops a greenish yellow or yellowish green fluorescence, and upon standing acquires a moderate yellowish orange to brown color.

Alcohol-insoluble matter—Add about 1 Gm. of powdered Aloe, accurately weighed, to 50 cc. of alcohol in a flask. Heat the mixture to boiling, and maintain at incipient boiling for 15 minutes, replacing any loss by evaporation. Remove from the heat, and shake the mixture at intervals during 1 hour, filter through a small dried and tared filter paper or a suitable dried and tared filtering crucible, and wash the residue on the filter with alcohol until the washings are colorless. Dry this residue to constant weight at 100° C., and weigh. The weight of the anhydrous residue does not exceed 10 per cent of the weight of the Aloe taken for the test.

Assay—Determine the per cent of water-soluble extractive in Aloe as directed on page 632.

U. S. P. Product of Aloe—Aloinum.

AVERAGE DOSE—Metric, 0.25 Gm.—Apothecaries, 4 grains.

ALOINUM

Aloin

Aloin.

Aloin is a mixture of active principles obtained from aloe. It varies in chemical composition and in physical and chemical properties according to the variety of aloe from which it is obtained.

Description—Aloin occurs as a lemon yellow to dark yellow, microcrystalline powder, or as minute crystals. It is odorless, or has a slight odor of aloë. Its taste is intensely bitter. Aloin darkens on exposure to light and air.

Solubility—Aloin is soluble in water, in alcohol, and in acetone, the degree of solubility varying with its composition. It is slightly soluble in ether.

Identification—

A: Aloin is soluble in ammonia T.S. and in solutions of alkali hydroxides, forming red solutions (or yellow solutions that become red) having a green fluorescence.

B: A drop of ferric chloride T.S. added to an alcoholic solution of Aloin produces a brownish green color.

Ash—Aloin yields not more than 0.6 per cent of ash, page 628.

Reaction—A saturated aqueous solution of Aloin is yellow but becomes brown on standing. The solution is neutral or not more than faintly acid to litmus paper.

Emodin—Shake 1 Gm. of Aloin with 10 cc. of benzene for 1 minute, and filter the mixture: the filtrate when shaken with 10 cc. of a mixture of equal volumes of ammonia T.S. and distilled water imparts to the mixture not more than a faint, pink color.

Water-insoluble substances—Place about 1 Gm. of Aloin, accurately weighed, in 120 cc. of distilled water, at 25° C., and agitate it frequently during 2 hours. Collect the undissolved residue, if any, on a filter paper or in a filtering crucible, tared after it has been dried at 100° C., wash the residue with 25 cc. of distilled water, and dry it at 100° C.: the weight of the dried residue does not exceed 1.5 per cent of the weight of Aloin taken for the test.

Storage—Preserve Aloin in tight, light-resistant containers.

AVERAGE DOSE—Metric, 15 mg.—Apothecaries, $\frac{1}{4}$ grain.

ALTHÆA

Althea

Marsh Mallow Root

Althea is the dried root of *Althæa officinalis* Linné (Fam. *Malvaceæ*), deprived of the brown, corky layer and small roots.

Althea contains not more than 1 per cent of foreign organic matter, page 628

Description—

Unground Althea—Slenderly tapering, when entire up to 30 cm. in length and 2 cm. in diameter, usually cut into small pieces, about 5 mm. in thickness; externally pale yellow to pale brown, longitudinally furrowed, frequently spirally twisted and covered with somewhat loosened bast fibers; fracture of bark fibrous, of wood short and granular; internally yellowish white; bark 1 to 2 mm. thick, porous, with mucilage cells, and separated from the slightly radiating wood by a distinct grayish cambium zone; odor slight; taste sweetish, mucilaginous.

Powdered Althea—White to weak yellow; starch grains numerous, up to 30 microns in diameter, usually with a long central cleft; groups of fibers with thick, more or less lignified walls; tracheæ with scalariform thickenings or with bordered pores; calcium oxalate crystals few, in rosette aggregates, 20 to 35 microns in diameter.

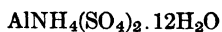
Identification—Mix 1 Gm. of comminuted Althea with 10 cc. of cold distilled water, stir the mixture occasionally during 30 minutes, then filter it through purified cotton. The mucilage so obtained has a weak yellow color and is only slightly acid to litmus paper; it assumes a moderate to strong yellow color when treated with sodium hydroxide T.S. and has neither a sour nor an ammoniacal odor.

Storage—Preserve Althea against attack by insects, page 5.

ALUMEN

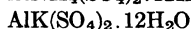
Alum

Alum.



Ammonium Alum

Mol. wt. 453.32



Potassium Alum

Mol. wt. 474.38

Alum contains not less than 99.5 per cent of Ammonium Alum [$\text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$] or of Potassium Alum [$\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$].

The label of the container must indicate whether the salt is Ammonium Alum or Potassium Alum.

Description—Alum occurs as large, colorless crystals, crystalline fragments, or as a white powder. Alum is odorless, and has a sweetish, strongly astringent taste.

Solubility—One Gm. of Ammonium Alum is soluble in 7 cc. of water at 25° C., and in about 0.3 cc. of boiling water. One Gm. of Potassium Alum is soluble in 7.5 cc. of water at 25° C., and in about 0.3 cc. of boiling water. Alum is insoluble in alcohol. It is freely but slowly soluble in glycerin.

Identification—

A: Sodium hydroxide T.S. added to an aqueous solution of Ammonium Alum (1 in 20) at first produces a precipitate which completely dissolves in an excess of the reagent, ammonia being evolved.

B: Sodium hydroxide T.S. added to an aqueous solution of Potassium Alum (1 in 20) at first produces a precipitate, which completely dissolves in an excess of the reagent, but no ammonia is evolved.

C: When held in a non-luminous flame, Potassium Alum imparts to it a violet color.

D: The addition of 10 cc. of sodium bitartrate T.S. to 5 cc. of a saturated aqueous solution of Potassium Alum produces within 30 minutes a white, crystalline precipitate.

E: An aqueous solution of Alum (1 in 20) responds to the tests for aluminum, page 587, and for sulfate, page 592.

Reaction—An aqueous solution of Alum (1 in 20) is acid to litmus paper.

Alkalies and earths—Completely precipitate the aluminum from a boiling solution of 1 Gm. of Ammonium Alum in 100 cc. of distilled water by the addition of enough ammonia T.S. to render the solution distinctly alkaline to methyl red T.S., and filter. Evaporate the filtrate to dryness, and ignite: the weight of the residue does not exceed 5 mg.

Arsenic—An aqueous solution of Alum meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Dissolve 1 Gm. of Alum in sufficient distilled water to make 20 cc., and add 5 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 586, for Alum is 20 parts per million.

Iron—Add 5 drops of potassium ferrocyanide T.S. to 20 cc. of an aqueous solution of Alum (1 in 150): no blue color is produced immediately.

Assay—Dissolve about 1 Gm. of Alum, accurately weighed, and about 1 Gm. of ammonium chloride in 250 cc. of distilled water. Heat the solution to boiling, and add a slight excess of ammonia T.S. to precipitate aluminum hydroxide. Collect the precipitate on a filter, wash thoroughly with hot distilled water, dry, ignite strongly, and weigh. The weight of the aluminum oxide so obtained, multiplied by 8.894, indicates its equivalent in $\text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ and, multiplied by 9.307, indicates its equivalent in $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.

Storage—Preserve Alum in well-closed containers.

U. S. P. Product of Alum—Alumen Exsiccatum.

ALUMEN EXSICCATUM

Exsiccated Alum

Alum. Exsic.—Dried Alum, Burnt Alum

Exsiccated Alum, when recently dried to constant weight at 200° C., contains not less than 96.5 per cent of anhydrous Ammonium Alum $[\text{AlNH}_4(\text{SO}_4)_2]$ or of anhydrous Potassium Alum $[\text{AlK}(\text{SO}_4)_2]$.

The label of the container must indicate whether the Exsiccated Alum was made from Ammonium Alum or Potassium Alum.

Description—Exsiccated Alum is a white, odorless powder. It has a sweetish, astringent taste, and absorbs moisture on exposure to air.

Solubility—One Gm. of Exsiccated Alum is very slowly and usually incompletely soluble in about 20 cc. of water at 25° C. One Gm. of it is soluble in about 2 cc. of boiling water. It is insoluble in alcohol.

Identification—Exsiccated Alum responds, respectively, to the tests for identification for ammonium alum or potassium alum under *Alumen*, page 49.

Loss on drying—Dry about 1 Gm. of Exsiccated Alum, accurately weighed, to constant weight at 200° C.: its loss in weight does not exceed 10 per cent.

Residue insoluble in water—Add 2.0 Gm. of Exsiccated Alum to 40 cc. of distilled water, and allow it to stand with occasional agitation for 24 hours. Collect the insoluble residue on previously dried, counterbalanced filter papers, or in a filtering crucible, wash it with 50 cc. of distilled water, and finally dry it to constant weight at 100° C.: the residue weighs not more than 50 mg.

Alkalies and earths—Exsiccated Ammonium Alum meets the requirements of the test for *alkalies and earths*, under *Alumen*, page 49, allowance being made for the difference in the percentage of water present.

Arsenic, heavy metals, iron—Exsiccated Alum meets the requirements of the tests for *arsenic, heavy metals*, and *iron* under *Alumen*, page 49, allowance being made for the difference in the percentage of water present.

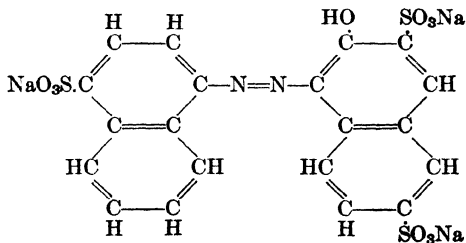
Assay—Dry about 0.5 Gm. of Exsiccated Alum to constant weight at 200° C., weigh accurately, and dissolve it in 100 cc. of distilled water. Filter, if necessary, thoroughly wash the insoluble residue with distilled water, dilute the filtrate and washings to about 250 cc. with distilled water, and add 1 Gm. of ammonium chloride. Proceed with the assay as directed under *Alumen*, page 49, beginning with the words, "Heat the solution." The weight of the aluminum oxide so obtained, multiplied by 4.652, indicates its equivalent in $\text{AlNH}_4(\text{SO}_4)_2$ and multiplied by 5.066, its equivalent in $\text{AlK}(\text{SO}_4)_2$.

Storage—Preserve Exsiccated Alum in tight containers.

AMARANTHUM

Amaranth

Amaranth.—F. D. and C. Red No. 2



Mol. wt. 604.48

Amaranth is the trisodium salt of 1-(4-sulfo-1-naphthylazo)-2-naphthol-3,6-disulfonic acid.

Description—Amaranth occurs as a dark red brown powder.

Solubility—One Gm. of Amaranth dissolves in about 15 cc. of water, at 25° C.; it is very slightly soluble in alcohol.

Color—The color of the aqueous solution (1 in 100) when viewed through a depth of 1 cm. is vivid red. The color of this aqueous solution is not appreciably changed by the addition of hydrochloric acid; sodium hydroxide T.S. intensifies the color. Solutions of Amaranth are fairly stable when exposed to light.

Standard—Amaranth complies with the specification for F.D. and C. Red No. 2 as listed in the Coal-Tar Color Regulations promulgated under the authority of the Food, Drug and Cosmetic Act.

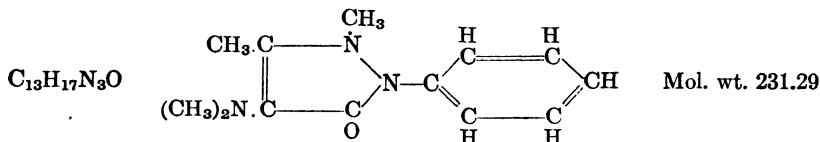
Storage—Preserve Amaranth in well-closed containers.

U. S. P. Product of Amaranth—Liquor Amaranthi.

AMINOPYRINA

Aminopyrine

Aminopyrin.—Amidopyrine



Description—Aminopyrine occurs as odorless, colorless or white, small crystals, or as a white, crystalline powder. It is stable in air but is affected by light.

Solubility—One Gm. of Aminopyrine dissolves in 18 cc. of water, in 1.5 cc. of alcohol, in 1 cc. of chloroform, and in 13 cc. of ether, at 25° C.

Melting point—Aminopyrine melts between 107° and 109° C., page 595.

Identification—

A: To 5 cc. of an aqueous solution of Aminopyrine (1 in 25) add 3 drops of diluted hydrochloric acid and 1 cc. of ferric chloride T.S.: a bluish violet color is produced in the mixture. On the subsequent addition of a few drops of diluted sulfuric acid, the color changes to violet red.

B: The addition of 5 drops of silver nitrate T.S. to 5 cc. of an aqueous solution of Aminopyrine (1 in 25) produces a deep violet color in the mixture (other oxidizing substances yield the same color). The mixture develops a grayish black precipitate of metallic silver on standing.

C: To a solution of about 20 mg. of Aminopyrine in 5 cc. of distilled water add 2 drops of sulfuric acid and 2 drops of a 10 per cent solution of sodium, nitrite, and agitate the mixture: it assumes a blue color which disappears quickly, the liquid afterwards remaining colorless (the appearance of a green color indicates the presence of *antipyrene*).

D: An aqueous solution of Aminopyrine (1 in 25) added to a freshly prepared solution of potassium ferrieyanide T.S., containing a little ferric chloride, produces at once a dark blue color or precipitate (difference from *antipyrene*).

Loss on drying—When dried over sulfuric acid for 18 hours, Aminopyrine loses not more than 1 per cent of its weight.

Ash—Aminopyrine yields not more than 0.15 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.1 Gm. of Aminopyrine in 1 cc. of sulfuric acid: the solution is colorless, page 563.

Reaction—An aqueous solution of Aminopyrine (1 in 25) is slightly alkaline to litmus paper.

Chloride—Add a few drops of silver nitrate T.S. to 5 cc. of an aqueous solution of Aminopyrine (1 in 25), previously acidulated with a few drops of diluted nitric acid: a purple color may develop but no turbidity is produced at once.

Heavy metals—Dissolve 1 Gm. of Aminopyrine in 2 cc. of diluted acetic acid and sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Aminopyrine is 20 parts per million.

Antipyrine—To 0.1 Gm. of Aminopyrine add 0.1 Gm. of vanillin, 5 cc. of distilled water, and 2 cc. of sulfuric acid, and heat the mixture to boiling: no more color is developed than is obtained by adding 5 cc. of distilled water and 2 cc. of sulfuric acid to 0.1 Gm. of vanillin and heating the mixture to boiling.

Storage—Preserve Aminopyrine in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

AMMONII CARBONAS

Ammonium Carbonate

Ammon. Carb.

Ammonium Carbonate consists of ammonium acid carbonate ($\text{NH}_4\text{-HCO}_3$) and ammonium carbamate ($\text{NH}_2\text{.COO.NH}_4$) in varying proportions, and yields not less than 30 per cent and not more than 33 per cent of NH_3 .

For medicinal purposes, use only translucent pieces of Ammonium Carbonate.

Description—Ammonium Carbonate occurs in white, hard, translucent masses, having a strong odor of ammonia, without empyreuma, and with a sharp, ammoniacal taste. It is affected by light. On exposure to air, it loses ammonia and carbon dioxide, becoming opaque, and is finally converted into friable, porous lumps or a white powder.

Solubility—One Gm. of Ammonium Carbonate is very slowly soluble in about 4 cc. of water at 25° C. It is decomposed by hot water.

Identification—When heated, Ammonium Carbonate is volatilized without charring, and the vapor is strongly alkaline to moistened litmus paper. An aqueous solution of Ammonium Carbonate (1 in 20) effervesces with acids.

Residue on ignition—Ammonium Carbonate yields not more than 0.05 per cent of residue.

Reaction—An aqueous solution of Ammonium Carbonate (1 in 20) is alkaline to litmus paper.

Chloride—A 2-Gm. portion of Ammonium Carbonate shows no more *chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 2-Gm. portion of Ammonium Carbonate shows no more *sulfate* than corresponds to 0.1 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Reduce Ammonium Carbonate to a coarse powder, and volatilize 2 Gm. of it on a water bath; dissolve the residue in 1 cc. of diluted hydrochloric acid, and evaporate to dryness. Dissolve the residue in 2 cc. of diluted acetic acid, and add sufficient distilled water to measure 25 cc.: the heavy metals limit, page 586, for Ammonium Carbonate is 10 parts per million.

Empyreumatic matter—Add a slight excess of nitric acid to an aqueous solution containing 1 Gm. of Ammonium Carbonate, and evaporate to dryness on a water bath: a colorless, odorless residue is obtained.

Assay—Place in a weighing bottle about 10 cc. of distilled water, tare the bottle and its contents, add about 2 Gm. of unaltered, translucent Ammonium Carbonate, and weigh accurately. Transfer the contents of the bottle to a 200-cc. flask, add

50 cc. of normal sulfuric acid, and, when solution has been effected, titrate the excess of acid with normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.01703 Gm. of NH_3 .
Storage—Preserve Ammonium Carbonate in tight containers, preferably at a temperature not above 30°C ., protected from light.

U. S. P. Product of Ammonium Carbonate—*Spiritus Ammoniae Aromaticus*.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

AMMONII CHLORIDUM

Ammonium Chloride

Ammon. Chlorid.—Muriate of Ammonia

NH_4Cl

Mol. wt. 53.50

Ammonium Chloride, when dried over sulfuric acid for 4 hours, contains not less than 99.5 per cent of NH_4Cl .

Description—Ammonium Chloride occurs as colorless crystals or as a white, fine or coarse, crystalline powder. It has a cool, saline taste, and is somewhat hygroscopic.
Solubility—One Gm. of Ammonium Chloride is soluble in 2.6 cc. of water, in about 100 cc. of alcohol, and in about 8 cc. of glycerin, at 25°C . One Gm. of it is soluble in 1.4 cc. of boiling water.

Identification—An aqueous solution of the salt (1 in 10) responds to the tests for ammonium, page 587, and for chloride, page 589.

Loss on drying—When dried over sulfuric acid for 4 hours, Ammonium Chloride loses not more than 0.5 per cent of its weight.

Residue on ignition—Add 1 cc. of sulfuric acid to about 2 Gm. of the salt, accurately weighed, and heat the mixture gently until volatilization is complete. The residue is white, and when ignited leaves not more than 0.1 per cent of non-volatile substances.

Free acid—Dissolve 2 Gm. of Ammonium Chloride in 20 cc. of cold, distilled water, and add 1 drop of methyl red T.S. If a pink color is produced, the addition of not more than 0.05 cc. of tenth-normal sodium hydroxide is required to change the color to yellow.

Thiocyanate—Acidulate 10 cc. of an aqueous solution of Ammonium Chloride (1 in 10) with hydrochloric acid and add a few drops of ferric chloride T.S.: the mixture does not become red.

Heavy metals—Dissolve 2 Gm. of Ammonium Chloride in 2 cc. of diluted acetic acid and sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Ammonium Chloride is 10 parts per million.

Assay—Dry about 0.2 Gm. of Ammonium Chloride over sulfuric acid for 4 hours, weigh accurately, dissolve it in about 40 cc. of distilled water, and add 50 cc. of tenth-normal silver nitrate and 5 cc. of nitric acid. Add sufficient distilled water to make the mixture measure 100 cc., and mix well. Pass the liquid through a dry filter into a dry flask, and reject the first 10 cc. of filtrate. To exactly 50 cc. of the subsequent filtrate add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate in this portion of the filtrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.005350 Gm. of NH_4Cl .

Storage—Preserve Ammonium Chloride in tight containers.

U. S. P. Product of Ammonium Chloride—*Capsulæ Ammonii Chloridi*.

AVERAGE DOSE—

Metric

Apothecaries

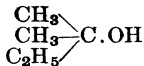
Expectorant, single dose, 0.3 Gm.—5 grains.

Diuretic, daily dose, 3 to 6 Gm.—45 to 90 grains.

AMYLENI HYDRAS

Amylene Hydrate

Amylen. Hydr.—Tertiary Amyl Alcohol



Mol. wt. 88.15

Description—Amylene Hydrate occurs as a clear, colorless liquid, having a camphoraceous odor, and a burning taste.

Solubility—One Gm. of Amylene Hydrate dissolves in about 8 cc. of water at 25° C.

It is miscible with alcohol, with chloroform, with ether, and with glycerin.

Specific gravity—The specific gravity of Amylene Hydrate is not less than 0.803 and not more than 0.807 at 25° C.

Boiling point—Amylene Hydrate boils between 97° and 103° C., page 559.

Identification—

A: Mix 2 cc. of Amylene Hydrate with 15 cc. of distilled water, 5 cc. of sulfuric acid, and 10 Gm. of potassium dichromate, and heat the mixture under a reflux condenser for 2 hours, then distil the mixture, collecting the first 2 cc. of distillate: the distillate responds to the *identification tests* under *Acetone*, page 11. Continue the distillation until most of the water has distilled over, make the distillate alkaline with sodium hydroxide T.S., add diluted sulfuric acid, dropwise, until the solution is neutral to litmus paper, and carefully evaporate to dryness: the residue responds to the *identification tests* for acetate, page 587.

B: To 10 cc. of an aqueous solution of Amylene Hydrate (1 in 10) quickly add 5 cc. of a solution of vanillin in sulfuric acid (1 in 100): a violet red color is produced.

Non-volatile residue—Evaporate 20 cc. of Amylene Hydrate in a porcelain dish on a water bath to a volume of about 2 cc., and then allow it to evaporate spontaneously to dryness: the residue, if any, is colorless, and when dried at 100° C. for 2 hours, weighs not more than 50 mg.

Reaction—An aqueous solution of Amylene Hydrate (1 in 10) is neutral to litmus paper.

Heavy metals—Evaporate 1 Gm. of Amylene Hydrate to dryness on a steam bath, warm the residue gently with 1 cc. of tenth-normal hydrochloric acid, dilute to a volume of 25 cc. with distilled water, and filter if necessary: the heavy metals limit, page 586, for Amylene Hydrate is 5 parts per million.

Aldehyde—To 10 cc. of an aqueous solution of Amylene Hydrate (1 in 20) add 1 cc. of ammoniacal silver nitrate T.S., and heat the mixture on a water bath at 60° C. for 10 minutes: no darkening occurs.

Readily oxidizable substances—To 10 cc. of an aqueous solution of Amylene Hydrate (1 in 20) add 0.1 cc. of tenth-normal potassium permanganate: the pink color is not entirely discharged within 10 minutes.

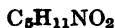
Water—To 10 cc. of Amylene Hydrate add 1 Gm. of anhydrous cupric sulfate, and shake well: the cupric sulfate does not become blue.

Storage—Preserve Amylene Hydrate in tight containers.

AMYLIS NITRIS

Amyl Nitrite

Amyl. Nitris



Mol. wt. 117.15

Amyl Nitrite contains not less than 90 per cent of $C_5H_{11}ONO$.

Description—Amyl Nitrite is a clear, yellowish liquid, having a peculiar, ethereal, fruity odor, and a pungent, aromatic taste. It is volatile even at low temperatures and is inflammable.

Solubility—Amyl Nitrite is almost insoluble in water, but is miscible with alcohol and with ether.

Specific gravity—The specific gravity of Amyl Nitrite is not less than 0.865 and not more than 0.875 at 25° C.

Identification—

A: Add 2 cc. of sulfuric acid to a mixture of 2 drops of Amyl Nitrite and 2 drops of distilled water: when diluted with water, amyl valerate is produced, recognized by its odor.

B: Add a few drops of Amyl Nitrite to a mixture of 1 cc. of ferrous sulfate T.S. and 5 cc. of diluted hydrochloric acid: a greenish brown color is produced.

Free acid—Mix 1 cc. of normal sodium hydroxide and 10 cc. of distilled water with a drop of phenolphthalein T.S. in a glass-stoppered cylinder, and add 5 cc. of Amyl Nitrite. After the cylinder is inverted three times, the red tint of the aqueous layer is still perceptible.

Aldehyde—To a mixture of 1.5 cc. of silver nitrate T.S. and 1.5 cc. of aldehyde-free alcohol add a few drops of ammonia T.S. until the precipitate first formed is redissolved. Then add 1 cc. of Amyl Nitrite, and gently heat for 1 minute: the mixture does not become brown or black.

Assay—Place about 20 cc. of aldehyde-free alcohol in a 100-cc., glass-stoppered volumetric flask, and weigh accurately. From a pipette add from 3 to 4 cc. of Amyl Nitrite, stopper the flask, again weigh accurately, and calculate the weight of the Nitrite taken for assay. Add enough aldehyde-free alcohol to make the mixture measure 100 cc. at 25° C., stopper the flask, and mix thoroughly. Proceed as directed for the *Nitrite Assay*, page 597, using 10 cc. of the alcoholic solution. One cc. of tenth-normal sodium thiosulfate is equivalent to 0.01172 Gm. of $C_5H_{11}ONO$.

Storage—Preserve Amyl Nitrite in tight containers.

AVERAGE DOSE—Inhalation, Metric, 0.2 cc.—Apothecaries, 3 minims.

AMYLUM

Starch

Corn Starch

Starch consists of the granules separated from the grain of *Zea Mays* Linné (Fam. *Gramineæ*).

Description—Starch occurs as irregular, angular, white masses or as a fine powder, and consists chiefly of polygonal, rounded, or spheroidal grains from 3 to 35 microns in diameter and usually with a circular or several-rayed central cleft. It is odorless, and has a slight, characteristic taste.

Solubility—Starch is insoluble in cold water and in alcohol.

Identification—

A: Prepare a smooth mixture of 1 Gm. of Starch with 2 cc. of cold water, stir the mixture into 15 cc. of boiling water, boil gently for 2 minutes, and cool the mixture: the product is a translucent, whitish jelly.

B: Starch is colored purplish blue to deep blue by iodine T.S.

Loss on drying—Starch loses not more than 14 per cent of its weight when dried for 4 hours at 120° C.

Ash—Starch yields not more than 0.5 per cent of ash, page 628.

Reaction—Triturate about 0.5 Gm. of Starch with 5 cc. of distilled water: the mixture is neutral to litmus paper.

Iron—Mix 10 cc. of distilled water with 0.5 Gm. of Starch, and add 0.5 cc. of hydrochloric acid and 3 drops of potassium ferrocyanide T.S.: the mixture does not become blue within 1 minute.

Storage—Preserve Starch in well-closed containers.

U. S. P. Product of Starch—Glyceritum Amyli.

ANTIMONII ET POTASSII TARTRAS

Antimony and Potassium Tartrate

Antimon. et Pot. Tart.—Antimonyl Potassium Tartrate, Tartar Emetic

$K(SbO)C_4H_4O_6 \cdot \frac{1}{2}H_2O$

Mol. wt. 333.94

Antimony and Potassium Tartrate contains not less than 99 per cent of $KOOC.CHOH.CHOH.COO(SbO) \cdot \frac{1}{2}H_2O$.

Description—Antimony and Potassium Tartrate occurs as colorless, odorless, transparent crystals, or as a white powder. The crystals effloresce upon exposure to air.

Solubility—One Gm. of Antimony and Potassium Tartrate is soluble in 12 cc. of water and in about 15 cc. of glycerin, at 25° C. One Gm. of it is soluble in about 3 cc. of boiling water. It is insoluble in alcohol.

Identification

A: When heated to redness, Antimony and Potassium Tartrate chars, emits an odor resembling that of burning sugar, and leaves a blackened residue. This residue has an alkaline reaction, and when a small fragment of it is held in a non-luminous flame, a violet tint is produced.

B: In an aqueous solution of Antimony and Potassium Tartrate (1 in 20) acidulated with hydrochloric acid, hydrogen sulfide T.S. produces an orange red precipitate, which is soluble in ammonium sulfide T.S. or in sodium hydroxide T.S.

Reaction—An aqueous solution of Antimony and Potassium Tartrate (1 in 20) is slightly acid to litmus paper.

Arsenic—Dissolve 0.1 Gm. of Antimony and Potassium Tartrate in 5 cc. of hydrochloric acid. Add 10 cc. of a recently prepared solution of 20 Gm. of stannous chloride in 30 cc. of hydrochloric acid. Mix well, transfer to a color-comparator tube, and allow to stand for 30 minutes. Viewed downward over a white surface, the color of the mixture appears no deeper than that of a solution contained in a similar color-comparator tube, prepared and treated in the same manner, omitting the Antimony and Potassium Tartrate, and to which has been added 0.02 mg. of arsenic trioxide.

Iron—A 10-cc. portion of an aqueous solution of Antimony and Potassium Tartrate (1 in 100), acidulated with acetic acid, does not at once assume a blue color on the addition of 5 drops of potassium ferrocyanide T.S.

Assay—Dissolve about 0.5 Gm. of Antimony and Potassium Tartrate, accurately weighed, in 30 cc. of distilled water, add 25 cc. of a cold, saturated solution of sodium bicarbonate and a few drops of starch T.S., and immediately titrate with tenth-normal iodine to the production of a persistent blue color. Each cc. of tenth-normal iodine is equivalent to 0.01670 Gm. of $KOOC.CHOH.CHOH.COO(SbO) \cdot \frac{1}{2}H_2O$.

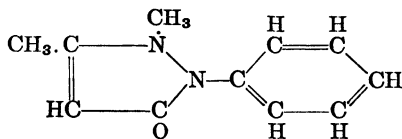
Storage—Preserve Antimony and Potassium Tartrate in well-closed containers.

AVERAGE DOSE—Metric, 3 mg.—Apothecaries, $\frac{1}{20}$ grain.

ANTIPYRINA

Antipyrine

Antipyrin.—Phenazone

 $C_{11}H_{12}N_2O$ 

Mol. wt. 188.22

Description—Antipyrine occurs as colorless crystals, or as a white, crystalline powder. It is odorless and has a slightly bitter taste.

Solubility—One Gm. of Antipyrine dissolves in less than 1 cc. of water, in 1.3 cc. of alcohol, in 1 cc. of chloroform, and in 43 cc. of ether, at 25° C.

Melting point—Antipyrine melts between 111° and 113° C., page 595.

Identification—

- A: The addition of tannic acid T.S. to an aqueous solution of Antipyrine produces an abundant white precipitate.
- B: Mix 0.1 Gm. of sodium nitrite and 12 cc. of an aqueous solution of Antipyrine (1 in 100): the liquid is nearly colorless, but upon the addition of 1 cc. of diluted sulfuric acid develops a deep green color.
- C: One drop of ferric chloride T.S. added to 2 cc. of a dilute aqueous solution of Antipyrine (1 in 1000) produces a deep red color, which, upon the addition of 10 drops of sulfuric acid, becomes light yellow.
- D: To 0.1 Gm. of Antipyrine add 0.1 Gm. of vanillin, 5 cc. of distilled water, and 2 cc. of sulfuric acid, and heat the mixture to boiling: it develops an orange yellow precipitate.

Loss on drying—When dried over sulfuric acid for 18 hours, Antipyrine loses not more than 1 per cent of its weight.

Ash—Antipyrine yields not more than 0.15 per cent of ash, page 556.

Reaction—An aqueous solution of Antipyrine (1 in 20) is neutral to litmus paper.

Heavy metals—Dissolve 1 Gm. of Antipyrine in 2 cc. of diluted acetic acid and add sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Antipyrine is 20 parts per million.

Completeness and color of solution—Antipyrine is completely soluble in its own weight of cold distilled water, the solution being colorless or not more than slightly yellow when viewed transversely in a tube having a diameter of about 20 mm.

Storage—Preserve Antipyrine in well-closed containers.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

ANTITOXINUM DIPHTHERICUM

Diphtheria Antitoxin

Antitox. Diph.—Purified Antidiphtheric Serum, Concentrated Diphtheria Antitoxin, Refined Diphtheria Antitoxin, Antidiphtheric Globulins

Diphtheria Antitoxin is a sterile aqueous solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal which has been immunized against diphtheria toxin. After the serum or plasma from the immunized animal has been collected, the antitoxin-bearing globulins are separated from the other constituents of the serum

or plasma and dissolved in freshly distilled water. Sodium chloride and a preservative are then added and the solution is filtered through a bacteria-excluding filter. Diphtheria Antitoxin has a potency of not less than 500 antitoxic units per cc. Diphtheria Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Diphtheria Antitoxin is a transparent or slightly opalescent liquid of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Diphtheria Antitoxin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and its total solids must not exceed 20 per cent.

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units, and the unit shall be that of the standard Diphtheria Antitoxin distributed by the National Institute of Health of the United States Public Health Service.

The outside label must bear the name *Diphtheria Antitoxin* and indicate the minimum number of antitoxic units in the package, the manufacturer's lot number of the Antitoxin, the name, address, and the license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained. This date is 1 year from the date of issue from the manufacturing establishment if at the time the Antitoxin was placed in the container it had an excess of 20 per cent over the declared minimum potency, 2 years for a 30 per cent excess, 3 years for a 40 per cent excess, or 4 years for a 50 per cent excess.

Storage—Preserve Diphtheria Antitoxin at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20,000 units; prophylactic, 1000 units.

ANTITOXINUM SCARLATINÆ STREPTOCOCCICUM

Scarlet Fever Streptococcus Antitoxin

Antitox. Scarlat. Streptococ.—Scarlet Fever Antitoxin, Refined Scarlet Fever Antitoxin, Concentrated Scarlet Fever Antitoxin, Anti-Scarlet Fever Globulins

Scarlet Fever Streptococcus Antitoxin is a sterile aqueous solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal which has been immunized against the toxin produced by the streptococcus regarded as causative of scarlet fever. Scarlet Fever Streptococcus Antitoxin has a potency of not less than 400 antitoxic units per cc. Scarlet Fever Streptococcus Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Scarlet Fever Streptococcus Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish or greenish color, nearly odorless

or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Scarlet Fever Streptococcus Antitoxin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and its total solids must not exceed 20 per cent.

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units and the unit shall be that of the standard Scarlet Fever Antitoxin distributed by the National Institute of Health of the United States Public Health Service.

The outside label must bear the name *Scarlet Fever Streptococcus Antitoxin* and must indicate the minimum number of antitoxin units in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained.

Storage—Preserve Scarlet Fever Streptococcus Antitoxin at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 6000 units; prophylactic, 2000 units.

ANTITOXINUM TETANICUM

Tetanus Antitoxin

Antitox. Tet.—Purified Antitetanic Serum, Concentrated Tetanus Antitoxin, Refined Tetanus Antitoxin, Antitetanic Globulins

Tetanus Antitoxin is a sterile aqueous solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal which has been immunized against tetanus toxin. After the serum or plasma from the immunized animal has been collected, the antitoxin-bearing globulins are separated from the other constituents of the serum or plasma, and dissolved in freshly distilled water. Sodium chloride and a preservative are then added and the solution is filtered through a bacteria-excluding filter. Tetanus Antitoxin has a potency of not less than 400 antitoxic units per cc.* Tetanus Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Tetanus Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight granular deposit. Tetanus Antitoxin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and its total solids must not exceed 20 per cent.

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units, and the unit shall be that of the standard Tetanus Antitoxin distributed by the National Institute of Health of the United States Public Health Service.

* The International Unit—The unit of potency for Tetanus Antitoxin referred to in this Pharmacopœia is known as the "American Unit"; it is approximately double the strength of the "International Unit" established by the Permanent Standards Commission of the Health Organization of the League of Nations.

The outside label must bear the name *Tetanus Antitoxin* and must indicate the minimum number of antitoxic units in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained. This date is 1 year from the date of issue from the manufacturing establishment if at the time the Antitoxin was placed in the container it had an excess of 20 per cent over the declared minimum potency, 2 years for a 30 per cent excess, 3 years for a 40 per cent excess, or 4 years for a 50 per cent excess.

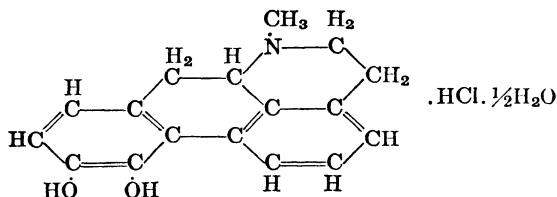
Storage—Preserve Tetanus Antitoxin at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20,000 units; prophylactic, 1500 units.

APOMORPHINÆ HYDROCHLORIDUM

Apomorphine Hydrochloride

Apomorph. Hydrochlor.



C₁₇H₁₇O₂N.HCl. $\frac{1}{2}$ H₂O

Mol. wt. 312.79

Apomorphine Hydrochloride is the hydrochloride of an alkaloid prepared from morphine.

Caution—*Apomorphine Hydrochloride must be rejected if it at once imparts an emerald green color to 100 parts of distilled water when shaken with it in a test tube.*

Description—Apomorphine Hydrochloride occurs as minute, white or grayish white, glistening crystals which acquire a greenish tint upon exposure to light and air. It is odorless.

Solubility—One Gm. of Apomorphine Hydrochloride dissolves in about 50 cc. of water and in about 50 cc. of alcohol, at 25° C. One Gm. dissolves in about 20 cc. of water at 80° C. It is very slightly soluble in chloroform and in ether.

Identification—

A: To 5 cc. of an aqueous solution of Apomorphine Hydrochloride (1 in 100) add a slight excess of a solution of sodium bicarbonate (1 in 20): a white or greenish white precipitate is formed. Add 3 drops of iodine T.S., and shake the mixture vigorously: an emerald green solution is produced. Add 5 cc. of ether, and after vigorous shaking, allow the layers to separate: the ethereal solution is colored deep ruby red, while the aqueous layer retains its green color.

B: Apomorphine Hydrochloride dissolves in nitric acid, producing a dark purple solution.

C: Silver nitrate T.S. added to an aqueous solution of Apomorphine Hydrochloride produces a white precipitate, insoluble in nitric acid. This precipitate soon turns black by reduction to metallic silver, and is rapidly reduced upon the addition of ammonia T.S.

Ash—The ash from 0.2 Gm. of Apomorphine Hydrochloride is negligible, page 556.

Reaction—A saturated aqueous solution of Apomorphine Hydrochloride is neutral to litmus paper.

Decomposition products—Shake 0.1 Gm. of Apomorphine Hydrochloride with 5 cc. of ether: the latter acquires not more than a pale reddish color.

Storage—Preserve Apomorphine Hydrochloride in small, tight, light-resistant vials, containing not more than 0.35 Gm.

AVERAGE DOSE—Emetic, subcutaneous—Metric, 5 mg.—

Apothecaries, $\frac{1}{12}$ grain.

AQUA

Water

H₂O

Mol. wt. 18.02

Water conforms to the following requirements and tests.

Description—Water is a clear, colorless liquid which is practically tasteless and odorless.

Reaction—Place 10 cc. of Water in a test tube, and add 2 drops of methyl red pH indicator: no red color is produced. Another 10-cc. portion of Water does not show a pink or red color on the addition of 2 drops of phenolphthalein T.S.

Heavy metals—To 40 cc. of Water, heated to 50° C., add 1 cc. of diluted acetic acid and 10 cc. of freshly prepared hydrogen sulfide T.S., and allow the liquid to stand for 10 minutes. The color of the liquid when viewed downward over a white surface is no darker than the color of a mixture of 40 cc. of the same Water with 10 cc. of distilled water using matched Nessler tubes for the comparison.

Zinc—To 50 cc. of Water contained in a glass tube add 3 drops of glacial acetic acid and 0.5 cc. of potassium ferrocyanide T.S. The solution shows no more turbidity than that produced by 50 cc. of distilled water in a similar glass tube, treated in the same manner, and viewed downward over a dark surface.

Foreign volatile matter—When heated nearly to the boiling point and agitated, Water evolves no odor.

Dissolved solids—Evaporate 100 cc. of Water to dryness on a water bath, and dry the residue in an oven to constant weight at 100° C.: not more than 0.10 Gm. of residue remains.

B. coli—Water meets the standards for freedom from *B. coli* required for potable water by the United States Public Health Service.

U. S. P. Products of Water—Aqua Destillata, Aqua Destillata Sterilisata, Aqua Pro Injectione.

AQUÆ AROMATICÆ

Aromatic Waters

Aromatic Waters are saturated solutions (unless otherwise specified) of volatile oils or other aromatic or volatile substances in distilled water. Their odors and tastes are similar, respectively, to those of the drugs or volatile substances from which they are prepared, and they are free from empyreumatic and other foreign odors. Aromatic Waters should be

protected from intense light and stored preferably in containers stoppered with purified cotton to allow access of some air but to exclude dust.

Aromatic Waters are prepared by one of the following processes:

(a) *Distillation*—Place the odoriferous portion of the plant or drug from which the Aromatic Water is to be prepared in a suitable still with sufficient distilled water, and distil most of the water, carefully avoiding the development of empyreumatic odors through the charring or scorching of the substances. Separate the excess of oil, and preserve or use the clear aqueous portion, filtered if necessary.

(b) *Solution*—

Take of:

THE VOLATILE OIL, OR OTHER SPECIFIED VOLATILE

SUBSTANCE..... 2 cc. or 2 Gm.

DISTILLED WATER, a sufficient quantity,

To make..... 1000 cc.

Shake the volatile substance (suitably comminuted if a solid) with 1000 cc. of distilled water in a capacious bottle, and repeat the shaking several times during a period of about 15 minutes. Set the mixture aside for 12 hours or longer, filter through wetted filter paper, and pass enough distilled water through the filter to make the product measure 1000 cc.

Alternative Solution Method—

The following method for preparing Aromatic Waters by solution is alternative with the method just prescribed. Thoroughly incorporate the volatile oil (or the suitably comminuted volatile solid) with 15 Gm. of purified talc or with a sufficient quantity of purified siliceous earth or pulped filter paper. Add 1000 cc. of distilled water, and thoroughly agitate the mixture several times during 10 minutes. Then filter the mixture, returning the first portions, if necessary, to obtain a clear filtrate, and add enough distilled water through the filter to make the product measure 1000 cc.

AQUA ANISI

Anise Water

Aq. Anisi

Anise Water is a clear, saturated solution of oil of anise in distilled water, prepared by one of the processes described under *Aquæ Aromaticæ*, page 62.

AQUA AURANTII FLORUM

Orange Flower Water

Aq. Aurant. Flor.

Orange Flower Water is a saturated solution of the odoriferous principles of the flowers of *Citrus Aurantium* Linné (Fam. *Rutaceæ*), prepared by distilling the fresh flowers with water and separating the excess volatile oil from the clear, aqueous portion of the distillate. Its odor is best preserved by allowing a limited access of fresh air to the container.

Description—Orange Flower Water is nearly colorless, clear or only faintly opalescent, possessing the pleasant odor and taste of orange blossoms. It must be free from empyreuma, mustiness, and fungoid growths.

Residue—Evaporate 100 cc. of Orange Flower Water on a water bath, and dry the residue to constant weight at 100° C.: not more than 15 mg. of residue remains.

Reaction—Orange Flower Water is neutral or only slightly acid to litmus paper.

Heavy metals—Add 2 cc. of diluted acetic acid to 5 cc. of Orange Flower Water and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Orange Flower Water is 2 parts per million.

U. S. P. Product of Orange Flower Water—Syrupus Aurantii Florum.

AQUA CAMPHORÆ

Camphor Water

Aq. Camph.

Camphor Water is a saturated solution of camphor in distilled water, prepared by solution of the camphor as described under *Aquæ Aromaticæ*, page 62.

AQUA CHLOROFORMI

Chloroform Water

Aq. Chlorof.

CHLOROFORM,

DISTILLED WATER, each, a sufficient quantity.

To a convenient quantity of distilled water contained in a dark amber-colored bottle, add enough chloroform to maintain a slight excess after the mixture has been repeatedly and thoroughly agitated, taking care that there is always an excess of chloroform present.

When Chloroform Water is to be dispensed, decant the quantity required from the separated chloroform.

Storage—Preserve Chloroform Water in well-closed containers, protected from light.

AVERAGE DOSE—Metric, 15 cc.—Apothecaries, 4 fluidrachms.

AQUA CINNAMOMI

Cinnamon Water

Aq. Cinnam.

Cinnamon Water is a clear, saturated solution of oil of cinnamon in distilled water, prepared by one of the processes described under *Aquæ Aromaticæ*, page 62.

AQUA DESTILLATA

Distilled Water

Aq. Dest.

H₂O

Mol. wt. 18.02

Distilled Water is water purified by distillation.

Description—Distilled Water is a colorless, clear liquid, without odor or taste.

Dissolved solids—Evaporate 100 cc. of Distilled Water to dryness on a water bath, and dry the residue to constant weight at 100° C.: not more than 1 mg. of residue remains.

Reaction—Add 2 drops of methyl red pH indicator to 10 cc. of Distilled Water in a test tube: no red color is produced, indicating a pH of not less than 5.0. A 10-cc. portion of Distilled Water shows no blue color on the addition of 5 drops of bromothymol blue pH indicator.

Chloride—To 100 cc. of Distilled Water add 5 drops of nitric acid and 1 cc. of silver nitrate T.S.: no opalescence is produced.

Sulfate—To 100 cc. of Distilled Water add 1 cc. of barium chloride T.S.: no turbidity is produced.

Ammonia—To 100 cc. of Distilled Water add 1 cc. of alkaline mercuric potassium iodide T.S.: not more than a faint yellow color is produced.

Calcium—To 100 cc. of Distilled Water add 2 cc. of ammonium oxalate T.S.: no turbidity is produced.

Carbon dioxide—To 25 cc. of Distilled Water add 25 cc. of calcium hydroxide T.S.: the mixture remains clear.

Heavy metals—To 40 cc. of Distilled Water add 1 cc. of diluted acetic acid and 10 cc. of freshly prepared hydrogen sulfide T.S., and allow the liquid to stand for 10 minutes. This liquid, when viewed downward over a white surface, appears no darker than 50 cc. of the same Distilled Water, matched Nessler tubes being used for the comparison.

AQUA DESTILLATA STERILISATA**Sterilized Distilled Water****Aq. Dest. Steril.**

Caution—Sterilized Distilled Water and Distilled Water are not to be used for parenteral administration or in preparations to be used parenterally. For such purpose, Water for Injection, page 66, is to be used.

Place distilled water in sterilized, suitable containers, properly sealed or closed, and sterilize preferably by Process C. See *Sterilization Methods*, page 616.

Sterilized Distilled Water meets the requirements of the tests under *Aqua Destillata*, page 64, and the *Sterility Test for Liquids*, page 609.

Storage—Preserve Sterilized Distilled Water in the container in which it was sterilized, and protect from contamination.

AQUA FŒNICULI**Fennel Water****Aq. Fœnic.**

Fennel Water is a clear, saturated solution of oil of fennel in distilled water, prepared by one of the processes described under *Aquæ Aromaticæ*, page 62.

AQUA MENTHÆ PIPERITÆ**Peppermint Water****Aq. Menth. Pip.**

Peppermint Water is a clear, saturated solution of oil of peppermint in distilled water, prepared by one of the processes described under *Aquæ Aromaticæ*, page 62.

AQUA MENTHÆ VIRIDIS**Spearmint Water****Aq. Menth. Vir.**

Spearmint Water is a clear, saturated solution of oil of spearmint in

distilled water, prepared by one of the processes described under *Aquæ Aromaticæ*, page 62.

AQUA PRO INJECTIONE

Water for Injection

Aq. pro Inject.

Caution—When “sterile water” or “sterile distilled water” for parenteral use is required or is dispensed as a vehicle, solvent, or diluent for substances to be administered parenterally, “Water for Injection” must be dispensed.

Water for Injection is water for parenteral use which has been distilled and sterilized within 24 hours. It is distilled, sterilized, and stored in sealed or other suitable sterile containers, so that it is free and remains free from pyrogens. Injection Water conforms to the *Sterility Test for Liquids*, page 609.

Sterilize Water for Injection preferably by Process C. See *Sterilization Methods*, page 616.

Use in preparations—Water for Injection in bulk, to be used for preparations for injection, is to be distributed in suitable containers and the contents preferably sterilized. Unused portions are to be discarded or resterilized, unless following sterilization the container is kept closed at all times and nothing enters but the filtered air needed for replacement, as the Water for Injection is drawn off.

If the pyrogen-free water for the preparation of injections is not sterilized before use, it must be collected after distillation preferably in sterile containers or in containers which have been cleansed, then rinsed well either with Water for Injection or with freshly distilled water, and the contents protected against contamination. During distillation, the receiving vessels are to be covered to prevent the entrance of contaminants. The time elapsing between distillation and use of the water in preparing injections is to be not over 24 hours. For details concerning the treatment of the finished injections, see *Injections*, pages 219 to 222, and *Containers for Injections*, pages 567 to 575.

Physical and chemical standards—Water for Injection meets the requirements of the tests under *Aqua Destillata*, page 64.

Pyrogens—Water for Injection or the distilled water used for injections meets the requirements of the *Pyrogen Test*, page 606.

Added substances—Preservatives and other added substances, see pages 219 and 220, are not to be added to Water for Injection except when it is employed in making preparations for injection.

AQUA ROSÆ

Rose Water

Aq. Ros.

STRONGER ROSE WATER,

DISTILLED WATER, each, 1 volume.

Mix them immediately before use.

Allowance being made for its dilution, Rose Water conforms to the description of, and meets the requirements of the tests under *Aqua Rosæ Fortior*, page 67.

AQUA ROSÆ FORTIOR

Stronger Rose Water

Aq. Ros. Fort.

Stronger Rose Water is a saturated solution of the odoriferous principles of the flowers of *Rosa centifolia* Linné (Fam. *Rosaceæ*), prepared by distilling the fresh flowers with water and separating the excess volatile oil from the clear, aqueous portion of the distillate. Its odor is best preserved by allowing a limited access of fresh air to the container.

Description—Stronger Rose Water is nearly colorless and clear, possessing the pleasant odor and taste of fresh rose blossoms. It must be free from empyreuma, mustiness, and fungoid growths.

Reaction—Stronger Rose Water is neutral or only slightly acid to litmus paper.

Residue—Evaporate 100 cc. of the Water on a water bath, and dry the residue to constant weight at 100° C.: not more than 15 mg. of residue remains.

Heavy metals—Add 2 cc. of diluted acetic acid to 5 cc. of Stronger Rose Water and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Stronger Rose Water is 2 parts per million.

U. S. P. Product of Stronger Rose Water—Aqua Rosæ.

ARGENTI NITRAS

Silver Nitrate

Arg. Nitræs

AgNO₃

Mol. wt. 169.89

Silver Nitrate, when powdered and dried to constant weight in the dark over sulfuric acid, contains not less than 99.8 per cent of AgNO₃.

Description—Silver Nitrate occurs as colorless or white crystals. On exposure to light in the presence of organic matter, Silver Nitrate becomes gray or grayish black.

Solubility—One Gm. of Silver Nitrate is soluble in 0.4 cc. of water and in 30 cc. of alcohol, at 25° C. One Gm. of Silver Nitrate is soluble in slightly more than 0.1 cc. of boiling water, and in about 6.5 cc. of boiling alcohol. It is slightly soluble in ether.

Identification—

A: An aqueous solution of Silver Nitrate (1 in 50) responds to the tests for silver, page 592.

B: Mix an aqueous solution of Silver Nitrate (1 in 10) in a test tube with a drop of diphenylamine T.S., and then carefully superimpose it upon sulfuric acid: a deep blue color appears at the zone of contact.

Clarity of solution and reaction—An aqueous solution of Silver Nitrate (1 in 10) is clear and colorless, and is neutral to litmus paper.

Copper—An aqueous solution of Silver Nitrate (1 in 10) is not colored even faintly blue by the addition of an excess of ammonia T.S.

Assay—Powder about 1 Gm. of Silver Nitrate, and dry it to constant weight in the dark over sulfuric acid. Weigh accurately about 0.8 Gm. of this dried salt, dissolve it in 50 cc. of distilled water, add 2 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of

tenth-normal ammonium thiocyanate is equivalent to 0.01699 Gm. of AgNO_3 .

Storage—Preserve Silver Nitrate in tight, light-resistant containers.

U. S. P. Product of Silver Nitrate—Argenti Nitras Induratus.

ARGENTI NITRAS INDURATUS

Toughened Silver Nitrate

Arg. Nitras Indur.—Moulded Silver Nitrate, Fused Silver Nitrate, Silver Nitrate Pencils, Lunar Caustic

Toughened Silver Nitrate contains not less than 94.5 per cent of AgNO_3 .

Description—Toughened Silver Nitrate occurs in white, crystalline masses generally moulded as pencils or cones. It breaks with a fibrous fracture. Toughened Silver Nitrate becomes gray or grayish black on exposure to light in the presence of organic matter.

Solubility—Toughened Silver Nitrate, with the exception of about 5 per cent which silver chloride, possesses the solubilities described under *Argenti Nitras*, page 6.

Reaction—A filtered, aqueous solution of Toughened Silver Nitrate (1 in 10) neutral to litmus paper.

Other tests—A filtered, aqueous solution of Toughened Silver Nitrate (1 in 10) meets the requirements of the tests for *identification* and for *copper* under *Argenti Nitras*, page 67.

Assay—Add about 0.8 Gm. of Toughened Silver Nitrate, accurately weighed, to 50 cc. of distilled water, and when the silver nitrate has dissolved, filter the solution. Thoroughly wash the filter and sediment with distilled water, add 2 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S. to the combined filtrate and washings, and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01699 Gm. of AgNO_3 .

Storage—Preserve Toughened Silver Nitrate in tight, light-resistant containers.

ARGENTUM PROTEINICUM FORTE

Strong Protein Silver

Arg. Prot. Fort.—Strong Silver Protein, Strong Protargin

Strong Protein Silver contains not less than 7.5 per cent and not more than 8.5 per cent of Ag.

Caution—*Solutions of Strong Protein Silver should be freshly prepared and should be dispensed in amber-colored bottles.*

Description—Strong Protein Silver occurs as a brown, odorless powder. It is usually somewhat hygroscopic and is affected by light.

Solubility—Strong Protein Silver is freely soluble in water, but almost insoluble in alcohol, in chloroform, and in ether.

Identification—

A: Heat about 0.2 Gm. of Strong Protein Silver in a porcelain crucible until all carbonaceous matter is burned off, warm the residue with 1 cc. of nitric acid, dilute with 10 cc. of distilled water, and add a few drops of hydrochloric acid: a white precipitate is produced which dissolves in ammonia T.S.

- B: The addition of 2 cc. of an aqueous solution of sodium chloride (1 in 100) to 10 cc. of an aqueous solution of Strong Protein Silver (1 in 100) produces no turbidity.
- C: Ferric chloride T.S. added to an aqueous solution of Strong Protein Silver (1 in 100) discharges the dark color, and a precipitate is gradually produced.
- D: To 10 cc. of an aqueous solution of Strong Protein Silver (1 in 50) add a few drops of mercuric chloride T.S.: a white precipitate is formed, and the supernatant liquid becomes colorless or nearly so.

Distinction from mild protein silver—Dissolve 1 Gm. of Strong Protein Silver in 10 cc. of distilled water. Add, all at once, 7 Gm. of reagent ammonium sulfate, and stir occasionally for 30 minutes. Filter through quantitative filter paper into a 50-cc. Nessler tube, returning the first portions of the filtrate to the filter, if necessary, to secure a clear filtrate, and allow the filter and precipitate to drain. Add to the clear filtrate 25 cc. of an aqueous solution of acacia (1 in 100). In a second 50-cc. Nessler tube dissolve 7 Gm. of reagent ammonium sulfate in 10 cc. of distilled water, and add to this solution 25 cc. of the solution of acacia and 1.6 cc. of hundredth-normal silver nitrate. To each tube add 2 cc. of nitric acid, 2 cc. of diluted hydrochloric acid, and enough of the acacia solution to make the volume of each solution measure 50 cc. Mix the contents of each tube thoroughly, and allow to stand for 5 minutes: the turbidity of the mixture containing the Strong Protein Silver is not greater than that to which no Strong Protein Silver has been added.

Assay—Ignite about 2 Gm. of Strong Protein Silver, accurately weighed, in a porcelain crucible until all of the carbon is burned off. Transfer as much as possible of the residue to a beaker, add to the crucible 5 cc. of nitric acid, warm to dissolve any adhering silver, and transfer the solution to the beaker with the aid of a little distilled water. Cover the beaker, and heat on a water bath until all of the metallic silver is dissolved, adding a little more nitric acid, if necessary. Filter into an Erlenmeyer flask, wash the insoluble residue thoroughly with distilled water, cool, and dilute with distilled water, if necessary, to about 75 cc. Add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01079 Gm. of silver.

Storage—Preserve Strong Protein Silver in tight, light-resistant containers.

ARGENTUM PROTEINICUM MITE

Mild Protein Silver

Arg. Prot. Mit.—Mild Silver Protein, Mild Protargin

Mild Protein Silver is silver rendered colloidal by the presence of, or combination with, protein. It contains not less than 19 per cent and not more than 23 per cent of Ag.

Caution—Solutions of Mild Protein Silver should be freshly prepared and should be dispensed in amber-colored bottles.

Description—Mild Protein Silver occurs as dark brown or almost black, shining scales or granules. It is odorless, is frequently hygroscopic, and is affected by light.

Solubility—Mild Protein Silver is freely soluble in water, but almost insoluble in alcohol, in chloroform, and in ether.

Identification—

- A: Heat about 0.1 Gm. of Mild Protein Silver in a porcelain crucible until all carbonaceous matter is burned off, warm the residue with 1 cc. of nitric acid, dilute with 10 cc. of distilled water, and add a few drops of hydrochloric acid: a white precipitate is produced which dissolves in ammonia T.S.

- B: The addition of 2 cc. of an aqueous solution of sodium chloride (1 in 100) to 10 cc. of an aqueous solution of Mild Protein Silver (1 in 100) produces no turbidity.
- C: Ferric chloride T.S. added to an aqueous solution of Mild Protein Silver (1 in 100) discharges the dark color and a precipitate is gradually produced.
- D: To 10 cc. of an aqueous solution of Mild Protein Silver (1 in 100) add a few drops of mercuric chloride T.S.: a white precipitate is formed and the supernatant liquid becomes colorless or nearly so.

Distinction from strong protein silver—Dissolve 1 Gm. of Mild Protein Silver in 10 cc. of distilled water. Add, all at once, 7 Gm. of reagent ammonium sulfate, and stir occasionally for 30 minutes. Filter through quantitative filter paper into a 50-cc. Nessler tube, returning the first portions of the filtrate to the filter, if necessary, to secure a clear filtrate, and allow the filter and precipitate to drain. Add to the clear filtrate 25 cc. of an aqueous solution of acacia (1 in 100). In a second 50-cc. Nessler tube dissolve 7 Gm. of reagent ammonium sulfate in 10 cc. of distilled water, and add to this solution 25 cc. of the solution of acacia and 1.6 cc. of hundredth-normal silver nitrate. To each tube add 2 cc. of nitric acid, 2 cc. of diluted hydrochloric acid, and enough of the acacia solution to make the volume of each solution 50 cc. Mix the contents of each tube thoroughly, and allow to stand for 5 minutes: the turbidity of the mixture containing the Mild Protein Silver is no greater than that to which no Mild Protein Silver has been added.

Assay—Proceed as directed under *Argentum Proteinicum Forte*, page 69, using about 1 Gm. of Mild Protein Silver.

Storage—Preserve Mild Protein Silver in tight, light-resistant containers.

ARSENI TRIOXIDUM

Arsenic Trioxide

Arsen. Trioxid.—Arsenious Acid, Arsenious Oxide

As_2O_3

Mol. wt. 197.82

Arsenic Trioxide, when dried to constant weight at 100°C ., contains not less than 99.5 per cent of As_2O_3 .

Description—Arsenic Trioxide occurs as a white, odorless powder. It is stable in air.

Caution—Arsenic Trioxide is extremely poisonous.

Solubility—Arsenic Trioxide is slowly soluble in water. It is slightly soluble in alcohol and in ether, and freely soluble in glycerin. It is dissolved by hydrochloric acid and by solutions of alkali hydroxides and carbonates.

Identification—Add hydrogen sulfide T.S. to an aqueous solution of Arsenic Trioxide (1 in 100) prepared with the aid of heat: the mixture is yellow. Add a few drops of hydrochloric acid to this mixture: a yellow precipitate of arsenic trisulfide is produced.

Loss on drying—When dried to constant weight at 100°C ., Arsenic Trioxide loses not more than 1 per cent of its weight.

Residue on ignition—Not more than 1 mg. of residue remains upon the ignition of 1 Gm. of Arsenic Trioxide.

Foreign substances—Dissolve 1 Gm. of Arsenic Trioxide in 10 cc. of ammonia T.S. with the aid of a gentle heat: a clear, colorless solution results.

Antimony, tin, or cadmium—Dissolve about 0.2 Gm. of Arsenic Trioxide in 50 cc. of distilled water with the aid of 2 cc. of hydrochloric acid, and completely precipitate the arsenic from the solution with hydrogen sulfide. Allow the precipitate to subside, and decant the clear liquid: the moist precipitate dissolves completely upon the addition of an excess of ammonium carbonate T.S.

Assay—Dissolve about 0.2 Gm. of Arsenic Trioxide, previously dried to constant weight at 100°C . and accurately weighed, in 20 cc. of boiling distilled water,

adding sufficient sodium hydroxide T.S. to effect complete solution. Neutralize this solution with diluted sulfuric acid, using phenolphthalein T.S. as the indicator, cool, dissolve in it 2 Gm. of sodium bicarbonate, and titrate with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.004946 Gm. of As_2O_3 .

Storage—Preserve Arsenic Trioxide in well-closed containers.

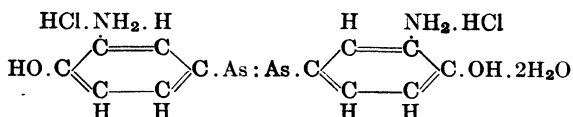
U. S. P. Products of Arsenic Trioxide—Liquor Acidi Arseniosi, Liquor Potassii Arsenitis.

AVERAGE DOSE—Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain.

ARSPHENAMINA

Arsphenamine

Arsphen.—Diaminodihydroxyarsenobenzene Dihydrochloride



$\text{C}_{12}\text{H}_{12}\text{As}_2\text{N}_2\text{O}_2 \cdot 2\text{HCl} \cdot 2\text{H}_2\text{O}$

Mol. wt. 475.01

Arsphenamine contains not less than 30 per cent and not more than 32 per cent of arsenic (As).

Arsphenamine must be prepared in an establishment licensed for the purpose by the United States Government upon recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Description—Arsphenamine occurs as a light yellow powder. It is odorless or has a slight odor, and is hygroscopic. In the dry state or in solution it is oxidized by exposure to the air, becoming darker and more toxic.

Solubility—Arsphenamine is soluble in water, in alcohol, and in glycerin, but only very slightly soluble in chloroform and in ether.

Identification—

- A: Add sodium hydroxide T.S., drop by drop, to 10 cc. of an aqueous solution of Arsphenamine (1 in 100): a precipitate is formed (difference from *Neoarsphenamine*), which dissolves readily in an excess of the sodium hydroxide.
- B: An aqueous solution of Arsphenamine (1 in 100) is unaffected by the addition of diluted hydrochloric acid, even after heating (difference from *neoarsphenamine*). With an excess of hydrochloric acid a precipitate is formed. The addition of diluted sulfuric acid or a solution of an alkali sulfate immediately produces a precipitate.
- C: The addition of 2 drops of freshly prepared ferric chloride T.S. to 5 cc. of an aqueous solution of Arsphenamine (1 in 1000) produces a brownish violet color, which rapidly changes to deep red.
- D: Add 3 cc. of silver nitrate T.S. to 5 cc. of an aqueous solution of Arsphenamine (1 in 100): a red color is produced, but no precipitate is formed

even after standing at ordinary room temperature for 10 minutes (difference from *neorsphenamine*).

- E: When a 6-cc. portion of silver nitrate T.S. is added to 5 cc. of an aqueous solution of Arsphenamine (1 in 100), a precipitate is immediately formed which blackens on heating. On now adding 5 cc. of nitric acid and again heating, the precipitate becomes white and dissolves in ammonia T.S.
- F: The solution resulting from the *Assay for arsenic* yields with hydrogen sulfide a yellow precipitate, soluble in ammonium carbonate T.S.
- G: An aqueous solution of Arsphenamine (1 in 100) is acid to litmus paper (difference from *neorsphenamine*).

Acidity—Dissolve 0.1 Gm. of Arsphenamine, accurately weighed, in 10 cc. of distilled water in a small flask, add 5 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide, watching the supernatant liquid for the end-point: it requires not less than 3.9 cc. and not more than 4.3 cc. of tenth-normal sodium hydroxide.

Completeness of solubility—Add 0.6 Gm. of Arsphenamine to 20 cc. of distilled water in a small flask and agitate the mixture gently: complete solution results within 15 minutes.

Thermostability—Expose the ampuled product to a temperature of 70° C. for a period of 48 hours: it shows no marked change in color, consistency, or solubility.

Assay for arsenic—Place about 0.2 Gm. of Arsphenamine, accurately weighed, in a glass-stoppered, 200- to 300-cc. flask. Add 1 Gm. of finely powdered potassium permanganate and 5 cc. of diluted sulfuric acid, and allow to stand for 10 minutes, frequently rotating the contents of the flask to insure thorough mixing. Cautiously add 10 cc. of sulfuric acid in portions of about 2 cc. each, rotating the flask after each addition. When the reaction has ceased, add sufficient hydrogen peroxide T.S. to dissolve the brown precipitate completely (about 5 to 7 cc.). Toward the end of the reaction the hydrogen peroxide T.S. is to be added drop by drop to avoid any great excess. Dilute with 25 cc. of distilled water, and boil gently over an asbestos-wire gauze for 15 to 20 minutes, or until the excess of hydrogen peroxide is expelled. Dilute with 50 cc. of distilled water, and add tenth-normal potassium permanganate until the liquid is faintly pink, then discharge the pink color by the addition of a drop of tenth-normal oxalic acid. Cool the solution, add 2.5 Gm. of potassium iodide, stopper the flask tightly, and allow it to stand in a cool, dark place for 1 hour. Then titrate the liberated iodine with tenth-normal sodium thiosulfate without the use of starch indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003746 Gm. of As.

Storage—Preserve Arsphenamine in a cool place, preferably not above 10° C., in sealed containers of colorless glass, from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the quantity in grams of the Arsphenamine contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label upon the outside of the container of one or more ampuls must bear the official title, the amount in grams of the Arsphenamine contained in the individual ampul, the lot number of the product, the name and address of the manufacturer, the U. S. License number of manufacturer, and the expiration date for the product.

The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its stability) shall not be more than 5 years from the date of release of that lot by the National Institute of Health.

AVERAGE DOSE—Intravenous, Metric, 0.3 Gm.—Apothecaries, 5 grains. *Prior to injection the solution must be alkalinized with 0.85 cc. of normal sodium hydroxide for each 0.1 Gm. of Arsphenamine.*

ASPIDIUM

Aspidium

Aspidium consists of the rhizome and stipes of *Dryopteris Filix-mas* (Linné) Schott, known in commerce as European Aspidium or Male Fern, or of *Dryopteris marginalis* (Linné) Asa Gray, known in commerce as American Aspidium or Marginal Fern (Fam. *Polypodiaceæ*).

Aspidium yields not less than 1.5 per cent of crude filicin. It yields not more than 2 per cent of foreign organic matter, page 628, and not more than 3 per cent of acid-insoluble ash, page 629.

Note—Only such portions as have retained their internal greenish color may be used.

Description—

Unground Aspidium—Rhizome, 1 to 3 cm. in thickness, cylindraceous and nearly straight, or curved and tapering toward one end, usually split longitudinally and showing large, angular stipe-scars, in which the ends of vascular bundles are often visible, and, occasionally, adhering feathery masses of reddish brown rammenta. Stipes, nearly cylindrical, but tapering toward one end, nearly straight or somewhat curved, 3 to 5 cm. in length, and about 8 mm. in thickness; externally weak reddish brown to brownish gray, or, if peeled, light brown to weak yellow; fracture short, internally pale green to weak greenish yellow, spongy, and exhibiting an interrupted circle of from 2 to 13 vascular bundles; odor slight; taste, at first sweetish and astringent, then bitter and acrid.

Histology—An outer row of epidermal cells and several rows of orange to greenish orange, thick-walled, lignified, hypodermal cells; a large central area consisting of starch-bearing, fundamental parenchyma with intercellular spaces into which project characteristic, more or less pyriform, short-stalked, oleoresin glands; vascular bundles xylocentric, consisting of a central xylem composed of scalariform or occasionally reticulate tracheids, completely surrounded by a phloem of rounded, thin-walled phloem cells and sieve tubes, the bundle being surrounded by a 1- to 3-layered pericycle and a single row of endodermal cells; starch abundant, ovoid, oblong, ellipsoidal, or irregular, 2 to 25 microns in length. Ramentum composed of elongated, thin-walled cells with occasional 2-celled projections on the margin, but no glands, except at the base, where there are usually two.

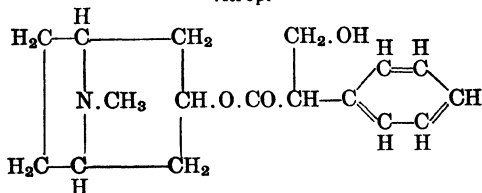
Assay—Prepare an ether extract from 40 Gm. of Aspidium as directed under *Oleo-resina Aspidii*, page 310, and assay it as directed under the *Oleo-resin*, using all of the oleoresin obtained for the assay.

U. S. P. Product of Aspidium—*Oleo-resina Aspidii*.

ATROPINA

Atropine

Atrop.



$\text{C}_{17}\text{H}_{23}\text{O}_3\text{N}$

Mol. wt. 289.36

An alkaloid usually obtained from *Atropa Belladonna* Linné and from species of *Datura* and *Hyoscyamus* (Fam. *Solanaceæ*).

Description—Atropine occurs as white crystals, usually needle-like, or as a white, crystalline powder. It is optically inactive. *Caution*—*Atropine is extremely poisonous.*

Solubility—One Gm. of Atropine dissolves in 460 cc. of water, in 2 cc. of alcohol, in about 27 cc. of glycerin, in 1 cc. of chloroform, and in about 25 cc. of ether, at 25° C. One Gm. of it dissolves in 90 cc. of water at 80° C.

Melting point—Atropine melts between 114° and 116° C., page 595.

Identification—

A: A saturated aqueous solution of Atropine is alkaline to phenolphthalein T.S.

B: Add a few drops of nitric acid to about 10 mg. of Atropine contained in a porcelain dish, and evaporate the mixture to dryness on a water bath: a yellow residue is obtained. Add to the cooled residue a few drops of alcoholic potassium hydroxide T.S. and a fragment of potassium hydroxide: the mixture is intensely violet in color (*hyoscyamine* and *scopolamine*, similarly treated, produce the same color as Atropine, but the presence of *other alkaloids* obscures the color effect).

C: Gold chloride T.S. produces in a solution of Atropine (1 in 50) in diluted hydrochloric acid a lusterless precipitate (*hyoscyamine* similarly treated yields a lustrous precipitate).

Ash—Atropine yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances and many other alkaloids—Dissolve 0.2 Gm. of Atropine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 556, and the solution becomes only light yellow upon the addition of 0.2 cc. of nitric acid.

Other alkaloids—Dissolve 0.2 Gm. of Atropine in 1 cc. of normal hydrochloric acid and sufficient distilled water to make exactly 15 cc. of solution. A 5-cc. portion of the solution yields no precipitate upon the addition of a few drops of platinic chloride T.S.

Apoatropine or belladonnine—To 4 cc. of the solution prepared for the test for *other alkaloids* add a slight excess of sodium hydroxide T.S.: the mixture becomes turbid. To a separate 5-cc. portion of the solution add 2 cc. of ammonia T.S.: the mixture does not immediately become turbid.

Storage—Preserve Atropine in well-closed, light-resistant containers.

U. S. P. Products of Atropine—Atropinæ Sulfas, Tabellæ Atropinæ Sulfatis.

AVERAGE DOSE—Metric, 0.4 mg.—Apothecaries, $\frac{1}{150}$ grain.

ATROPINÆ SULFAS

Atropine Sulfate

Atrop. Sulf.

$(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4 \cdot H_2O$

Mol. wt. 694.82

Description—Atropine Sulfate occurs as colorless crystals, or as a white, crystalline powder. It effloresces in dry air, and is affected by light.

Caution—*Atropine Sulfate is extremely poisonous.*

Solubility—One Gm. of Atropine Sulfate dissolves in 0.5 cc. of water, in 5 cc. of alcohol, and in about 2.5 cc. of glycerin, at 25° C. One Gm. of it dissolves in 2.5 cc. of boiling alcohol.

Melting point—Atropine Sulfate, dried for 4 hours at 110° C., melts between 192° and 196° C., the bath being preheated to 180° C., page 595.

Identification—

A: Add a few drops of nitric acid to about 10 mg. of Atropine Sulfate contained in a porcelain dish, and evaporate the mixture to dryness on a water bath: a yellow residue is obtained. Add to the cooled residue a few drops of alcoholic potassium hydroxide T.S. and a fragment of potassium hydroxide: the

mixture is intensely violet in color (*hyoscyamine* and *scopolamine*, similarly treated, produce the same color as Atropine Sulfate, but the presence of other alkaloids obscures the color effect).

B: Gold chloride T.S. produces in an aqueous solution of Atropine Sulfate (1 in 50) a lusterless precipitate (*hyoscyamine*, similarly treated, yields a lustrous precipitate).

C: An aqueous solution of Atropine Sulfate (1 in 20) responds to the test for sulfate, page 592.

Loss on drying—When dried at 110° C. for 4 hours, Atropine Sulfate loses not more than 4 per cent of its weight.

Ash—Atropine Sulfate yields not more than 0.2 per cent of ash, page 556.

Carbonizable substances and many other alkaloids—Dissolve 0.2 Gm. of Atropine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563, and the solution becomes only light yellow upon the addition of 0.2 cc. of nitric acid.

Reaction—An aqueous solution of Atropine Sulfate (1 in 20) is neutral to litmus paper.

Other alkaloids—In an aqueous solution of Atropine Sulfate (1 in 50), mixed with a few drops of hydrochloric acid, platinic chloride T.S. produces no precipitate.

Apoatropine or belladonnine—Dissolve 0.25 Gm. of Atropine Sulfate in enough distilled water to make 15 cc. of solution. To 4 cc. of this solution add a slight excess of sodium hydroxide T.S.: the mixture becomes turbid. To a separate 5-cc. portion of the solution add 2 cc. of ammonia T.S.: the mixture does not immediately become turbid.

Storage—Preserve Atropine Sulfate in tight, light-resistant containers.

U. S. P. Product of Atropine Sulfate—Tabellæ Atropinæ Sulfatis.

AVERAGE DOSE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

AURANTII AMARI CORTEX

Bitter Orange Peel

Aurant. Amar. Cort.

Bitter Orange Peel is the dried rind of the unripe fruit of *Citrus Aurantium* Linné (Fam. *Rutaceæ*).

Description—

Unground Bitter Orange Peel—In irregular bands (ribbons) or quarters from 2 to 6 mm. in thickness; outer surface weak brown to moderate olive with numerous pits and fine reticulate ridges; inner surface weak yellow to weak greenish yellow with many slight conical projections and fine anastomosing lines formed by the vascular bundles; fracture hard, short; odor fragrant and aromatic; taste aromatic and bitter.

Histology—An epidermis of small, angular cells; an outer parenchyma of thick-walled cells containing chloroplasts or chromoplasts and occasionally calcium oxalate prisms, and bearing the large schizo-lysigenous oil reservoirs, arranged mostly in two irregular rows; an inner spongy parenchyma of branched cells surrounding large intercellular spaces, and bearing delicate, anastomosing vascular bundles.

Powdered Bitter Orange Peel—Weak yellow to weak greenish yellow; fragments of parenchyma abundant, the cell walls from 4 to 12 microns thick; tracheæ very small with close spiral markings or simple pores; calcium oxalate prisms from 15 to 45 microns long.

U. S. P. Products of Bitter Orange Peel—Tinctura Aurantii Amari, Tinctura Gentianæ Composita.

AURANTII DULCIS CORTEX

Sweet Orange Peel

Aurant. Dulc. Cort.

Sweet Orange Peel is the fresh, outer rind of the non-artificially colored, ripe fruit of *Citrus Aurantium* Linné var. *sinensis* Linné (Fam. Rutaceæ).

Note—The inner, white portion of the rind should be excluded.

Description—

Unground Sweet Orange Peel—The outer, orange yellow layer separated from the fresh fruit by grating or paring and consisting of epidermal cells, parenchyma, and oil reservoirs with globules of volatile oil; odor highly fragrant; taste pungently aromatic.

U. S. P. Products of Sweet Orange Peel—Oleum Aurantii, Syrupus Aurantii, Tinctura Aurantii Dulcis.

BALSAMUM PERUVIANUM

Peruvian Balsam

Balsam. Peruv.—Balsam of Peru, Peru Balsam

Peruvian Balsam is obtained from *Myroxylon Pereiræ* (Royle) Klotzsch (Fam. Leguminosæ).

Description—Peruvian Balsam is a dark brown, viscid liquid. It is transparent and appears reddish brown in thin layers. It has an agreeable odor resembling vanilla, a bitter, acid taste, with a persistent after-taste, and is free from stringiness or stickiness. It does not harden on exposure to air.

Solubility—Peruvian Balsam is nearly insoluble in water, but is soluble in alcohol, in chloroform, and in glacial acetic acid, with not more than an opalescence. It is only partly soluble in ether and in petroleum benzin.

Specific gravity—The specific gravity of Peruvian Balsam is not less than 1.150 and not more than 1.170 at 25° C.

Reaction—Water becomes acid to litmus paper when agitated with Peruvian Balsam.

Fixed oils—One Gm. of Peruvian Balsam forms a clear solution when shaken with a solution of 3 Gm. of chloral hydrate in 2 cc. of distilled water.

Rosin—Peruvian Balsam does not show the presence of rosin, page 608.

Turpentine—Shake about 1 Gm. of Peruvian Balsam with 5 cc. of purified benzin, and warm the mixture on a water bath for 10 minutes, adding a sufficient quantity of the solvent to replace that lost by evaporation. On evaporating 2 cc. of the filtered benzin solution, no odor of oil of turpentine is noticeable.

Acid value—Dissolve about 1 Gm. of Peruvian Balsam, accurately weighed, in 100 cc. of neutralized alcohol, add 1 cc. of phenolphthalein T.S., and titrate the solution with half-normal sodium hydroxide: the acid value is not less than 56 and not more than 84, page 578.

Cinnamein, saponification value—Mix about 3 Gm. of Peruvian Balsam, accurately weighed, with 30 cc. of sodium hydroxide T.S. in a separator, shake the mixture for a few minutes with 60 cc. of ether, and allow it to stand until complete separa-

tion into two layers has taken place. Draw off the lower aqueous layer and quickly filter the ether layer into a flask. Transfer 50 cc. of the ethereal filtrate (representing five-sixths of the weight of the Balsam taken) to a tared conical flask, evaporate the ether, and dry the residue at 100° C. for 30 minutes: the weight of the residue of cinnamein so obtained is equivalent to not less than 50 per cent and not more than 60 per cent of the weight of the Balsam represented by the 50 cc. of ether solution taken. Dissolve this residue in 25 cc. of alcohol, add 25 cc. of half-normal alcoholic potassium hydroxide, and heat the neutral mixture carefully on a water bath for 30 minutes, in a flask provided with a reflux condenser. Then add 1 cc. of phenolphthalein T.S., and titrate the excess of alkali with half-normal hydrochloric acid. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. The total volume of half-normal alcoholic potassium hydroxide consumed is equivalent to a saponification value for the cinnamein of not less than 230 and not more than 240, page 579.

Storage—Preserve Peruvian Balsam in tight containers and avoid exposure to excessive heat.

BALSAMUM TOLUTANUM

Tolu Balsam

Balsam. Tolu.—Balsam of Tolu, Tolu

Tolu Balsam is obtained from *Myroxylon Balsamum* (Linné) Harms (Fam. *Leguminosæ*).

Description—Tolu Balsam is a brown or yellowish brown, plastic solid; transparent in thin layers and brittle when old, dried, or exposed to cold temperatures. It has a pleasant, aromatic odor resembling that of vanilla, and a mild, aromatic taste.

Solubility—Tolu Balsam is nearly insoluble in water and in purified benzin. It is soluble in alcohol, in chloroform, and in ether. It dissolves in solutions of sodium and potassium hydroxides, usually leaving an insoluble residue.

Reaction—An alcoholic solution of Tolu Balsam (1 in 20) is acid to litmus paper.

Rosin, rosin oil, or copaiba—Tolu Balsam does not show the presence of rosin, page 608.

Acid value—Dissolve about 1 Gm. of Tolu Balsam, accurately weighed, in 50 cc. of neutralized alcohol, add 1 cc. of phenolphthalein T.S., and titrate the solution with half-normal alcoholic potassium hydroxide: the acid value is not less than 112 and not more than 168, page 578.

Saponification value—Add sufficient half-normal alcoholic potassium hydroxide to the neutralized liquid obtained in the preceding test to make the total volume of the alkali solution added exactly 20 cc., heat the liquid on a water bath for 30 minutes under a reflux condenser, and cool. Mix this liquid with 200 cc. of distilled water, or more if necessary, and titrate the excess of potassium hydroxide with half-normal hydrochloric acid. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. The total volume of half-normal alcoholic potassium hydroxide consumed is equivalent to a saponification value of not less than 154 and not more than 220, page 579.

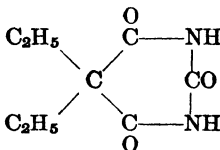
Storage—Preserve Tolu Balsam in tight containers and avoid exposure to excessive heat.

U. S. P. Products of Tolu Balsam—Syrupus Balsami Tolutani, Tinctura Benzoini Composita, Tinctura Balsami Tolutani.

BARBITALUM

Barbital

Barbital.—Diethylbarbituric Acid, Barbitone, Diethylmalonylurea



Mol. wt. 184.19

Description.—Barbital occurs as colorless or white crystals, or as a white, crystalline powder. It is odorless, has a slightly bitter taste, and is stable in air.

Solubility.—One Gm. of Barbital dissolves in 130 cc. of water, in about 15 cc. of alcohol, in 75 cc. of chloroform, and in 35 cc. of ether, at 25° C. One Gm. of it dissolves in about 13 cc. of boiling water. It is also soluble in acetone, and in ethyl acetate.

Melting point.—Barbital melts between 188° and 192° C., page 595.

Identification.—

A: A saturated aqueous solution of Barbital yields with mercuric nitrate T.S. a white precipitate which is soluble in ammonia T.S.

B: When Barbital is boiled with an excess of sodium carbonate T.S. for 30 minutes, or fused with sodium hydroxide, it is decomposed, with the evolution of ammonia.

Loss on drying.—When dried over sulfuric acid for 18 hours, Barbital loses not more than 1 per cent of its weight.

Ash.—Barbital yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances.—Dissolve 0.5 Gm. of Barbital in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction.—A saturated aqueous solution of Barbital is acid to litmus paper.

Benzene derivatives.—Shake 0.5 Gm. of Barbital with 5 cc. of nitric acid: the mixture does not become yellow.

Storage.—Preserve Barbital in well-closed containers.

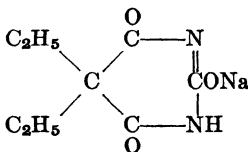
U. S. P. Product of Barbital.—Tabellæ Barbitali.

AVERAGE DOSE.—Metric, 0.3 Gm.—Apothecaries, 5 grains.

BARBITALUM SODICUM

Barbital Sodium

Barbital. Sod.—Barbitalum Solubile U. S. P. XI, Soluble Barbital, Sodium Diethylbarbiturate, Soluble Barbitone, Sodium Diethylmalonylurea



Mol. wt. 206.18

Barbital Sodium contains not less than 88 per cent and not more than 90 per cent of barbital ($\text{C}_8\text{H}_{12}\text{N}_2\text{O}_3$), calculated on a moisture-free basis, the moisture being determined on a separate portion by drying at 100° C. for 3 hours.

Description—Barbital Sodium occurs as a white powder. It is odorless, has a bitter taste, and is stable in air.

Solubility—One Gm. of Barbital Sodium dissolves in about 5 cc. of water at 25° C. and in 2.5 cc. of boiling water. It is slightly soluble in alcohol and is insoluble in ether.

Melting point—The barbital obtained in the assay melts between 188° and 192° C., page 595.

Identification—

A: A saturated aqueous solution of the barbital obtained in the assay yields with mercuric nitrate T.S. a white precipitate which is soluble in ammonia T.S.

B: The residue left upon the ignition of Barbital Sodium responds to the tests for sodium, page 592.

C: The addition of diluted hydrochloric or sulfuric acid to an aqueous solution of Barbital Sodium (1 in 20) produces a white precipitate of barbital.

Loss on drying—When dried at 100° C. for 3 hours, Barbital Sodium loses not more than 1 per cent of its weight.

Carbonizable substances—Dissolve 0.5 Gm. of Barbital Sodium in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—An aqueous solution of Barbital Sodium (1 in 20) is alkaline to litmus and to phenolphthalein.

Chloride—A 10-cc. portion of an aqueous solution of Barbital Sodium (1 in 100), acidulated with a few drops of nitric acid, yields no opalescence at once on the addition of a few drops of silver nitrate T.S.

Sulfate—A 10-cc. portion of an aqueous solution of Barbital Sodium (1 in 100), acidulated with 5 drops of hydrochloric acid, yields no turbidity within 1 minute on the addition of 1 cc. of barium chloride T.S.

Heavy metals—Dissolve 2 Gm. of Barbital Sodium in 40 cc. of distilled water. Add slowly, with vigorous stirring, 10 cc. of normal hydrochloric acid, and filter, rejecting the first 5 cc. of the filtrate: the heavy metals limit, page 586, for Barbital Sodium, determined upon 25 cc. of the filtrate, is 20 parts per million.

Uncombined barbital—Shake 0.5 Gm. of Barbital Sodium with 20 cc. of absolute ether for 10 minutes, filter, evaporate the ether in a tared dish, and dry the residue at 100° C. for 1 hour: the weight of the residue does not exceed 3 mg.

Assay—Dissolve about 0.5 Gm. of Barbital Sodium, accurately weighed, in 10 cc. of distilled water in a separator, add to the solution 15 cc. of diluted hydrochloric acid, and extract the liberated barbital by shaking successively with eight portions of 25 cc. each of ether. Wash the combined ether extracts with two portions of 5 cc. each of distilled water, and extract the combined water washings with two 5-cc. portions of ether. Evaporate the combined ether extracts in a tared dish or beaker at as low a temperature as is practicable, and dry the residue at 100° C. for 3 hours. The weight of barbital ($C_6H_{12}N_2O_3$) so obtained corresponds to not less than 88 per cent and not more than 90 per cent of the Barbital Sodium taken, calculated on a moisture-free basis.

Storage—Preserve Barbital Sodium in well-closed containers.

U. S. P. Product of Barbital Sodium—Tabellæ Barbitali Sodici.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

BARII SULFAS

Barium Sulfate



Mol. wt. 233.42

Caution—When Barium Sulfate is prescribed, the title should always be written out in full to avoid confusion with the poisonous barium sulfide or sulfite.

Description—Barium Sulfate is a fine, white, odorless, tasteless, bulky powder, free from grittiness.

Solubility—Barium Sulfate is insoluble in water, in organic solvents, and in aqueous solutions of acids and of alkalis.

Bulkiness—Place 5 Gm. of Barium Sulfate, previously sifted through a No. 60 sieve, in a graduated cylinder provided with a glass stopper, and having the 50-cc. graduation about 14 cm. from the bottom. Add enough distilled water to make the mixture measure 50 cc. Agitate the mixture briskly for exactly 1 minute, and set it aside for sedimentation: within 15 minutes the Barium Sulfate does not settle below the 12-cc. graduation.

Identification—

A: Mix 0.5 Gm. of Barium Sulfate with 2 Gm. each of anhydrous sodium carbonate and anhydrous potassium carbonate, heat the mixture in a crucible until fusion is complete, treat the resulting fused mass with hot distilled water, and filter. The filtrate, acidulated with hydrochloric acid, responds to the tests for sulfate, page 592.

B: Dissolve a portion of the well-washed residue from test A in acetic acid: the solution responds to the tests for barium, page 587.

Sulfide—Boil 10 Gm. of Barium Sulfate with a mixture of 10 cc. of diluted hydrochloric acid and 90 cc. of distilled water for 10 minutes in a 250-cc. Erlenmeyer flask, and add sufficient distilled water to restore the original volume. During the boiling, expose lead acetate test paper to the escaping vapor: the paper does not darken.

Acid-soluble substances—Cool the mixture obtained in the test for *sulfide*, and filter it through paper which has been previously washed with a mixture of 10 cc. of diluted hydrochloric acid and 90 cc. of distilled water, returning the first portions, if necessary, to obtain a perfectly clear filtrate. Evaporate 50 cc. of the filtrate to dryness on a water bath, and add 2 drops of hydrochloric acid and 10 cc. of hot distilled water. Filter through acid-washed paper, wash the filter with 10 cc. of hot distilled water, and evaporate the combined filtrate and washings to dryness in a tared dish on a water bath. The residue, when dried to constant weight at from 100° to 110° C., weighs not more than 15 mg.

Soluble barium salts—Treat the residue obtained in the test for *acid-soluble substances* with 10 cc. of distilled water, filter the solution through a filter previously washed with a mixture of 10 cc. of diluted hydrochloric acid and 90 cc. of distilled water, and add 0.5 cc. of diluted sulfuric acid: no turbidity develops within 30 minutes.

Free acid or alkali—Digest 1 Gm. of Barium Sulfate with 20 cc. of distilled water during 5 minutes: the water remains neutral to litmus paper.

Phosphate—Boil 1 Gm. of Barium Sulfate with a mixture of 3 cc. of nitric acid and 5 cc. of distilled water during 5 minutes, and add distilled water to restore the original volume. Filter through a filter previously washed with diluted nitric acid, and add to the warm filtrate an equal volume of ammonium molybdate T.S.: no yellow precipitate is formed.

Arsenic—A 2-Gm. portion of Barium Sulfate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Boil 4 Gm. of Barium Sulfate with 2 cc. of glacial acetic acid and 48 cc. of distilled water for 10 minutes. Add sufficient distilled water to make the volume measure 50 cc., filter, and use 25 cc. of the filtrate: the heavy metals limit, page 586, for Barium Sulfate is 10 parts per million.

Storage—Preserve Barium Sulfate in well-closed containers.

BELLADONNÆ FOLIUM

Belladonna Leaf

Bellad. Fol.—Deadly Nightshade Leaf, *Belladonnæ folium* P. I.

Belladonna Leaf consists of the dried leaf and top of *Atropa Belladonna* Linné (Fam. *Solanaceæ*).

Belladonna Leaf yields not less than 0.3 per cent of the alkaloids of Belladonna Leaf. It contains not more than 3 per cent of belladonna stems over 10 mm. in diameter, and yields not more than 3 per cent of acid-insoluble ash, page 629.

Description—

Unground Belladonna Leaf—Usually matted together, crumpled or broken; leaves mostly light green to moderate olive green, from 5 to 20 cm. in length, and from 4 to 12 cm. in width, broadly ovate, apex acute, margin entire, narrowed into the petiole, with few hairs, the latter more abundant along the veins, and numerous light-colored dots (crystal cells) visible with a lens; stems more or less hollow and flattened, finely hairy when young; flowers with campanulate corolla possessing 5 small, reflexed lobes, yellowish purple, becoming faded to brown or dusky yellow, usually subtended by the five-lobed calyx; fruit nearly globular, dark yellowish brown to dusky red or purplish black with numerous, flattened, somewhat reniform seeds, up to 2 mm. in width; odor slight, somewhat tobacco-like when moistened; taste somewhat bitter and acrid.

Histology—Leaf: epidermis of lamina with wavy vertical walls and distinctly striated cuticle; stomata more numerous on the lower surface and with 3 or 4 neighboring cells, one of which is smaller than the others; non-glandular hairs 2- to 6-celled; glandular hairs, short-stalked with 1- to many-celled heads; cells filled with microcrystals numerous in the mesophyll; midrib with strands of perimedullary phloem. Stem: with long, thin-walled, slightly lignified pericyclic fibers, bicollateral fibrovascular bundles, parenchyma interspersed with crystal cells, and a few hairs. Pollen grains narrow, ellipsoidal, with three meridional furrows. Seed: epidermis with convolute, thickened cell walls.

Powdered Belladonna Leaf—Light olive brown to moderate olive green in color. The following are among the elements of identification: the separate microcrystals, the dark gray crystal cells, the cuticular striping of the epidermal cells, the tracheæ with ellipsoidal, bordered pores, the fibers of the stem, and, rarely, the hairs and pollen grains. Examine Belladonna Leaf for rosette aggregates and raphides of calcium oxalate: their presence indicates adulteration.

Assay—Proceed as directed under *Hyoscyamus*, page 218, using 10 Gm. of Belladonna Leaf. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of Belladonna Leaf.

Storage—Preserve Belladonna Leaf in well-closed containers.

U. S. P. Products of Belladonna Leaf—Atropina, Atropinæ Sulfas, Extractum Belladonnæ (pilular and powdered), Tabellæ Atropinæ Sulfatis, Tinctura Belladonnæ, Unguentum Belladonnæ.

BELLADONNÆ RADIX

Belladonna Root

Bellad. Rad.—Deadly Nightshade Root

Belladonna Root is the dried root of *Atropa Belladonna* Linné (Fam. *Solanaceæ*).

1 Belladonna Root yields not less than 0.45 per cent of the alkaloids of Belladonna Root. It contains not more than 10 per cent of its stem bases and woody crowns, not more than 2 per cent of other foreign organic matter, page 628, and yields not more than 4 per cent of acid-insoluble ash, page 629.

Description—

Unground Belladonna Root—Cylindrical or tapering, sparingly branched, often split longitudinally or broken transversely; from 0.5 to 4 cm. in thickness; weak brown to moderate yellowish brown externally, light yellowish brown to pale yellow internally; somewhat wrinkled longitudinally, the soft periderm frequently abraded; fracture short, mealy, and emitting a puff of dust consisting chiefly of starch grains; nearly odorless when dry, but having a characteristic odor when moistened; taste sweetish, then bitterish and acrid.

Histology—Cork, composed of a few layers of thin-walled cells, a secondary cortex consisting of few to many layers of parenchyma cells, mostly filled with starch, a number with microcrystals, the latter relatively numerous in the younger roots; a relatively narrow phloem devoid of bast fibers and traversed by starch, and microcrystal-bearing medullary rays; a conspicuous cambium zone; a broad xylem composed of numerous wood wedges separated by starch- and microcrystal-bearing xylem rays; the xylem wedges with large porous or reticulate tracheæ in scattered groups separated by starch- and crystal-bearing wood parenchyma and, in the older roots, associated with wood-fibers; the medullary rays 1 to 5 cells wide.

Powdered Belladonna Root—Pale brown to weak yellow; starch grains numerous, simple, and compound, the single grains up to 30 microns in diameter and with a distinct, somewhat excentric hilum, the polarizing bands increasing in distinctness in direct ratio to the size of the grains; numerous sphenoidal microcrystals from 3 to 10 microns in length; fragments of tracheæ and wood-fibers few; long, thin-walled, slightly lignified pericyclic fibers from belladonna stem very few. Old fibrous roots contain an excess of lignified tissue. Raphides and rosette aggregates of calcium oxalate and tracheæ with diamond-shaped bordered pores are absent.

Assay—Proceed as directed under *Hyoscyamus*, page 218, using 10 Gm. of Belladonna Root. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of Belladonna Root.

Storage—Preserve Belladonna Root against attack by insects, page 5.

U. S. P. Product of Belladonna Root—Emplastrum Belladonnæ.

BENTONITUM

Bentonite

Bentonit.

Bentonite is a native, colloidal, hydrated aluminum silicate.

Description—Bentonite is a very fine, odorless, tasteless, and practically colorless powder, free from grit. It also occurs as small granules.

Solubility—Bentonite is insoluble in water, but swells to about eight times its volume when added to water, and produces an opalescent suspension or paste. It is insoluble in organic solvents and does not swell in these.

Identification—To 100 cc. of distilled water contained in a glass-stoppered cylinder of 100-cc. capacity, add 2 Gm. of Bentonite in divided portions, allowing each to settle before adding the next. The mass at the bottom gradually swells until it occupies an apparent volume of not less than 15 cc.

Fineness of powder—Add 2 Gm. of Bentonite to 20 cc. of distilled water, contained in a mortar. Allow to swell, disperse evenly with a pestle, and dilute the mixture with distilled water to 100 cc. Pour the suspension through a No. 200 standard mesh sieve and wash the sieve thoroughly with water. No grit is felt when the fingers are rubbed over the wire mesh of the sieve.

Loss on drying—When dried to constant weight at 110° C., Bentonite loses not less than 5 per cent and not more than 8 per cent of its weight.

Reaction—A 2 per cent suspension of Bentonite in distilled water has a pH between 9 and 10.

Arsenic—Bentonite meets the requirements of the test for *arsenic*, page 554.

Storage—Preserve Bentonite in well-closed containers.

U. S. P. Product of Bentonite—Mistura Cretae.

BENZINUM PURIFICATUM

Purified Benzin

Benzin. Purif.—Petroleum Ether, Purified Petroleum Benzin U. S. P. XI.

Purified Benzin is a purified distillate from petroleum, consisting of hydrocarbons, chiefly of the methane series.

Caution—Purified Benzin is highly inflammable, and its vapor, when mixed with air and ignited, may explode.

Description—Purified Benzin is a clear, colorless, non-fluorescent volatile liquid, having an ethereal or faint, petroleum-like odor, and a neutral reaction.

Solubility—Purified Benzin is practically insoluble in water. It is freely soluble in dehydrated alcohol, and is miscible with ether, chloroform, benzene, and with fixed and volatile oils, with the exception of castor oil.

Specific gravity—The specific gravity of Purified Benzin varies from 0.634 to 0.660 at 25° C.

Distillation range—Purified Benzin distils completely between 35° and 80° C. when tested by Method II, under *Boiling and Distilling Points*, page 560.

Non-volatile residue—Not more than 1 mg. of residue remains on evaporating 50 cc. of Purified Benzin in a glass or porcelain dish at a temperature not exceeding 40° C.

Sulfur compounds—Pour 10 cc. of Purified Benzin in portions upon clean, odorless filter paper laid on a warm glass plate: no disagreeable or notably sulfuretted odor becomes apparent as the last portions of liquid disappear from the paper, and no greasy stain remains.

Sulfur compounds or silver-reducing substances—Boil 10 cc. of Purified Benzin for a few minutes with one-fourth its volume of alcoholic ammonia T.S. and a few drops of silver nitrate T.S.: the liquid does not turn brown.

Benzene—Add 5 drops of Purified Benzin to a mixture of 40 drops of sulfuric acid and 10 drops of nitric acid in a test tube, warm the liquid for about 10 minutes, set it aside for 30 minutes, and then dilute it with distilled water in a shallow dish: no odor of nitrobenzene is evolved.

Storage—Preserve Purified Benzin in tight containers, remote from fire, at a temperature not above 30° C.

BENZOINUM

Benzoin

Benzoin.

Benzoin is the balsamic resin obtained from *Styrax Benzoin* Dryander, known in commerce as Sumatra Benzoin, or from *Styrax tonkinensis*

(Pièrre) Craib ex Hartwich, or other species of the Section *Anthostyrax* of the genus *Styrax*, known in commerce as Siam Benzoin (Fam. *Styracæ*).

Sumatra Benzoin yields not less than 75 per cent of alcohol-soluble extractive, page 631. It yields not more than 1 per cent of acid-insoluble ash, page 629.

Siam Benzoin yields not less than 90 per cent of alcohol-soluble extractive, page 631. It contains not more than 1 per cent of foreign organic matter, page 628, and yields not more than 0.5 per cent of acid-insoluble ash, page 629.

Description—

Unground Sumatra Benzoin—Blocks or lumps of varying size, made up of tears, compacted together with a reddish brown, reddish gray, or grayish brown resinous mass; tears externally yellowish or rusty brown, milky white on fresh fracture; hard and brittle at ordinary temperatures, but softened by heat and becoming gritty on chewing; odor aromatic. When digested with boiling water, the odor suggests cinnamates or storax; taste aromatic and slightly acid.

Unground Siam Benzoin—Pebble-like tears of variable size, compressed, yellowish brown to rusty brown externally, milky white on fracture, separate or very slightly agglutinated, hard and brittle at ordinary temperatures but softened by heat and becoming plastic on chewing; odor agreeable, balsamic, vanilla-like; taste aromatic and slightly acid.

Identification—The solution of Benzoin in alcohol becomes milky upon the addition of water and is acid to litmus paper.

Heat a few fragments of Benzoin in a test tube: Sumatra Benzoin evolves a sublimate consisting of plates and small, rod-like crystals that strongly polarize light. Siam Benzoin evolves a sublimate directly above the melted mass consisting of numerous long, rod-shaped crystals, which do not strongly polarize light.

Treat about 0.25 Gm. of Benzoin with 5 cc. of ether, decant about 1 cc. of the ether solution into a porcelain dish, and add to it 2 or 3 drops of sulfuric acid: the solution of Sumatra Benzoin produces a deep reddish brown coloration of the sulfuric acid and the solution of Siam Benzoin produces a deep purplish red coloration.

Cinnamic acid—Heat about 0.5 Gm. of Benzoin in a test tube with 10 cc. of potassium permanganate T.S.: only the Sumatra variety develops a strong odor of benzaldehyde.

Benzoic acid—Treat about 1 Gm. of powdered Benzoin with 15 cc. of warm carbon disulfide, filter, wash the filter with an additional 5 cc. of carbon disulfide, and allow the filtrate to evaporate spontaneously: the weight of the residue is not less than 12.5 per cent of the weight of the Benzoin taken. This residue responds to the test for *identification* under *Acidum Benzoicum*, page 17.

Assay—Place about 2 Gm. of Benzoin, accurately weighed, in a tared extraction thimble, and insert the thimble in a Soxhlet or other suitable continuous extraction apparatus. Place about 0.1 Gm. of sodium hydroxide in the receiving flask of the apparatus, and extract the Benzoin with alcohol for 5 hours, or until completely extracted. Dry the insoluble residue at 100° C. for 4 hours, and weigh. Determine the amount of moisture in the drug by the *Toluene Method*—IX, page 629. Calculate the weight of moisture in the quantity of the Benzoin used for the assay, and subtract it from the original weight of the Benzoin taken for the assay. The difference between this result and the weight of the residue determined above represents the alcohol-soluble extractive.

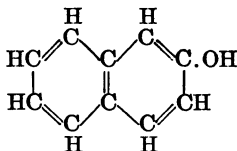
Storage—Preserve Benzoin in well-closed containers.

U. S. P. Products of Benzoin—*Tinctura Benzoini*, *Tinctura Benzoini Composita*.

BETANAPHTHOL

Betanaphthol

Betanaph.

 $C_{10}H_8O$ 

Mol. wt. 144.16

Description—Betanaphthol occurs as white to pale buff-colored, shining crystalline leaflets, or as a white or yellowish white, crystalline powder. It has a faint, phenol-like odor, and is stable in air, but darkens on exposure to sunlight. Betanaphthol sublimates readily when heated, and volatilizes with the vapors of alcohol and of water.

Solubility—One Gm. of Betanaphthol dissolves in about 1000 cc. of water, in 1 cc. of alcohol, in about 17 cc. of chloroform, and in 1.5 cc. of ether, at 25° C. One Gm. of it is soluble in about 80 cc. of boiling water. It is soluble in glycerin and in olive oil and is readily dissolved by solutions of alkali hydroxides.

Melting point—Betanaphthol melts between 120° and 122° C., page 595.

Identification—

- A: A cold, saturated, aqueous solution of Betanaphthol, when mixed with ammonia T.S., develops a faint, bluish fluorescence.
- B: Add about 0.1 Gm. of Betanaphthol to 5 cc. of an aqueous solution of potassium hydroxide (1 in 4), then add 1 cc. of chloroform, and gently warm the mixture: the aqueous layer acquires a blue color which changes successively to green and brown.
- C: Ferric chloride T.S. produces a greenish color in a cold, saturated aqueous solution of Betanaphthol, and after some time causes the separation of whitish flakes, which turn brown when heated.

Ash—Betanaphthol yields not more than 0.1 per cent of ash, page 556.

Free acid—Shake 1 Gm. of Betanaphthol with 100 cc. of distilled water at frequent intervals for 15 minutes, and filter the mixture: the filtrate is neutral to litmus paper.

Alphanaphthol—Boil 0.1 Gm. of Betanaphthol with 10 cc. of distilled water until dissolved, allow the solution to cool, and then filter it: the addition to the filtrate of 0.3 cc. of normal sodium hydroxide, followed by 0.3 cc. of tenth-normal iodine, produces no violet color in the mixture.

Naphthalene or other organic impurities—Agitate 0.5 Gm. of Betanaphthol in 30 cc. of ammonia T.S.: it dissolves completely and the solution has a color not deeper than pale yellow.

Storage—Preserve Betanaphthol in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 0.12 Gm.—Apothecaries, 2 grains.

BISMUTHI ET POTASSII TARTRAS

Bismuth and Potassium Tartrate

Bism. et Pot. Tart.—Potassium Bismuth Tartrate,
Potassium Bismuthyl Tartrate

Bismuth and Potassium Tartrate is a basic bismuth potassium bismuthotartrate containing the equivalent of not less than 60 per cent and not more than 64 per cent of bismuth (Bi).

Description—Bismuth and Potassium Tartrate is a granular, white, odorless powder, having a sweetish taste. It darkens on exposure to light.

Solubility—One Gm. of Bismuth and Potassium Tartrate dissolves in about 2 cc. of water. It is insoluble in alcohol, in ether, and in chloroform. It is decomposed by dilute mineral acids.

Identification—

A: Add ammonium sulfide T.S. to 5 cc. of an aqueous solution of Bismuth and Potassium Tartrate (1 in 10): a brownish black precipitate is produced in the mixture.

B: Bismuth and Potassium Tartrate imparts a violet color to a non-luminous flame.

C: Add a few drops of silver nitrate T.S. to 5 cc. of an aqueous solution of Bismuth and Potassium Tartrate (1 in 10): a white precipitate is produced. Boil the mixture: it blackens and a silver mirror is formed.

Alcohol-soluble extractive—Add about 1 Gm. of Bismuth and Potassium Tartrate, accurately weighed, to 20 cc. of alcohol in a flask provided with a reflux condenser, and boil the mixture for 15 minutes. Filter, wash the residue on the filter with 5 cc. of alcohol, evaporate the filtrate and washings in a tared dish, and dry to constant weight at 100° C.: the weight of the residue thus obtained does not exceed 0.5 per cent.

Arsenic—Bismuth and Potassium Tartrate meets the requirements of the test for *arsenic*, page 554.

Lead—Ignite 3 Gm. of Bismuth and Potassium Tartrate in a suitable crucible, cool, and add nitric acid, drop by drop, until the residue just dissolves upon warming. Pour the acid solution into 100 cc. of distilled water. Filter, evaporate the filtrate on a water bath to about 30 cc., and again filter. A 5-cc. portion of the clear filtrate, when mixed with an equal volume of diluted sulfuric acid, shows no turbidity, page 626.

Assay—Dissolve about 0.3 Gm. of Bismuth and Potassium Tartrate, accurately weighed, in 25 cc. of distilled water. Add 25 cc. of diluted nitric acid, and stir until the precipitate which is formed at first redissolves. Add ammonia T.S. until a permanent, white precipitate results. Add 2 cc. of nitric acid, and dilute to 100 cc. with distilled water. Heat the solution to boiling, and add gradually, with constant stirring, 50 cc. of a boiling aqueous solution containing 1.3 Gm. of dibasic ammonium phosphate in 100 cc. Digest the mixture for 1 hour at 80° C., decant the clear, hot, supernatant liquid, and pass it through a previously prepared, tared Gooch crucible. Repeat the decantation three times, using for each washing 50 cc. of hot distilled water containing about 3 per cent of ammonium nitrate. Transfer the precipitate to the Gooch crucible, using distilled water to effect its complete removal from the beaker. Dry the crucible and contents, and ignite at a dull red heat for 30 minutes. Cool in a desiccator, and weigh. The weight of bismuth phosphate thus obtained, multiplied by 0.6876, represents the weight of Bi in the weight of Bismuth and Potassium Tartrate taken for the assay.

Storage—Preserve Bismuth and Potassium Tartrate in well-closed, light-resistant containers.

U. S. P. Product of Bismuth and Potassium Tartrate—*Injectio Bismuthi et Potassii Tartratis*.

AVERAGE DOSE—Intramuscular, Metric, 0.15 Gm.—Apothecaries, $2\frac{1}{2}$ grains.

BISMUTHI SUBCARBONAS

Bismuth Subcarbonate

Bism. Subcarb.—Basic Bismuth Carbonate

Bismuth Subcarbonate is a basic salt, which, when dried over sulfuric acid for 18 hours, yields upon ignition not less than 90 per cent of Bi_2O_3 .

Description—Bismuth Subcarbonate is a white or pale yellowish white powder without odor and taste. It is stable in air, but is slowly affected by light.

Solubility—Bismuth Subcarbonate is insoluble in water and in alcohol.

Identification—Bismuth Subcarbonate is completely dissolved by nitric or hydrochloric acid with copious effervescence. The solution in nitric acid responds to the tests for bismuth, page 588.

Loss on drying—When dried over sulfuric acid for 18 hours, Bismuth Subcarbonate loses not more than 2 per cent of its weight.

Alkalies and earths—Mix 2 Gm. of Bismuth Subcarbonate with 40 cc. of a mixture of equal volumes of acetic acid and distilled water, and boil for 2 minutes. Cool the solution, filter, and add 2 cc. of diluted hydrochloric acid to 20 cc. of the filtrate. Precipitate the bismuth by passing hydrogen sulfide through the solution, boil the mixture for 1 minute, and again filter. Add to the filtrate 5 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.

Chloride—One Gm. of Bismuth Subcarbonate shows no more *chloride* than corresponds to 1 cc. of fiftieth-normal hydrochloric acid, page 626.

Nitrate—Agitate about 0.1 Gm. of Bismuth Subcarbonate with 5 cc. of a mixture of equal volumes of distilled water and ferrous sulfate T.S., and cautiously superimpose the mixture upon 5 cc. of sulfuric acid: no brownish red color appears at the zone of contact of the two liquids.

Dissolve 3 Gm. of Bismuth Subcarbonate in a sufficient quantity (about 4 cc.) of warm nitric acid, and pour the solution into 100 cc. of distilled water: a white precipitate is produced. Filter, evaporate the filtrate on a water bath to 30 cc., again filter the liquid, divide the latter filtrate into portions of 5 cc. each, and use these several portions in the tests for sulfate, copper, lead, and silver.

Sulfate—A portion of the test liquid is not at once visibly affected by a few drops of barium nitrate T.S.

Copper—To a portion of the test liquid, add a slight excess of ammonia T.S.: the supernatant liquid does not exhibit a bluish tint.

Lead—Mix another portion of the test liquid with an equal volume of diluted sulfuric acid: the liquid does not become cloudy.

Silver—In another portion of the test liquid, hydrochloric acid produces no precipitate which is insoluble in a slight excess of hydrochloric acid, but soluble in ammonia T.S.

Arsenic—Dissolve 0.2 Gm. of Bismuth Subcarbonate in a mixture of 2 cc. of sulfuric acid and 3 cc. of distilled water: this solution meets the requirements of the test for *arsenic*, page 554.

Assay—Dry about 1 Gm. of Bismuth Subcarbonate over sulfuric acid for 18 hours, weigh accurately in a tared porcelain crucible, and ignite to constant weight. The weight of Bi_2O_3 so obtained is not less than 90 per cent of the weight of dried Bismuth Subcarbonate taken for the assay.

Storage—Preserve Bismuth Subcarbonate in well-closed containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

BISMUTHI SUBNITRAS

Bismuth Subnitrate

Bism. Subnit.—Basic Bismuth Nitrate

Bismuth Subnitrate is a basic salt, which, when dried over sulfuric acid for 18 hours, yields upon ignition not less than 79 per cent of bismuth oxide (Bi_2O_3).

Description—Bismuth Subnitrate is a white, slightly hygroscopic powder.

Solubility—Bismuth Subnitrate is practically insoluble in water, insoluble in alcohol, but is readily dissolved by hydrochloric or nitric acid.

Identification—Bismuth Subnitrate responds to the tests for bismuth, page 588, and for nitrates, page 591.

Reaction—When brought in contact with moistened blue litmus paper, Bismuth Subnitrate shows a slightly acid reaction.

Loss on drying—When dried over sulfuric acid for 18 hours, Bismuth subnitrate loses not more than 3 per cent of its weight.

Carbonate—Add 3 Gm. of Bismuth Subnitrate to 3 cc. of warm nitric acid: no effervescence occurs.

Chloride—One Gm. of Bismuth Subnitrate shows no more *chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Ammonia—Boil about 0.1 Gm. of Bismuth Subnitrate with 5 cc. of sodium hydroxide T.S.: the vapor does not turn moistened red litmus paper blue.

Alkalies and earths—Boil 1 Gm. of Bismuth Subnitrate with 20 cc. of a mixture of equal volumes of acetic acid and distilled water, cool, and filter. Add 2 cc. of diluted hydrochloric acid, remove the bismuth by the addition of hydrogen sulfide, boil the mixture, and filter. Add to the filtrate 5 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.

Arsenic—Mix 0.2 Gm. of Bismuth Subnitrate with 2 cc. of sulfuric acid, heat the mixture until the fumes of sulfur trioxide are copiously evolved, and then cautiously dilute with distilled water until the solution measures 5 cc. This solution meets the requirements of the test for *arsenic*, page 554.

Lead, copper, sulfate, and silver—When the solution obtained in the test for carbonate is poured into 100 cc. of distilled water, a white precipitate is produced. Filter, evaporate the filtrate on a water bath to 30 cc., again filter, and divide the new filtrate into portions of 5 cc. each. These portions do not respond to the tests for *sulfate, copper, lead, and silver* under *Bismuthi Subcarbonas*, page 87.

Assay—Weigh accurately in a porcelain crucible about 1 Gm. of Bismuth Subnitrate, previously dried over sulfuric acid for 18 hours, and ignite to constant weight. The residue of bismuth oxide (Bi_2O_3) corresponds to not less than 79 per cent of the weight of Bismuth Subnitrate taken.

Storage—Preserve Bismuth Subnitrate in well-closed containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

BISMUTHI SUBSALICYLAS

Bismuth Subsaliolate

Bism. Subsaliol.—Basic Bismuth Salicylate

Bismuth Subsaliolate is a basic salt, which, when dried over sulfuric acid for 18 hours, yields upon ignition not less than 62 per cent and not more than 66 per cent of Bi_2O_3 .

Description—Bismuth Subsaliolate is a white or nearly white, amorphous, or microcrystalline, odorless powder. It is stable in air, but is affected by light.

Solubility—Bismuth Subsaliolate is practically insoluble in cold water.

Identification—

A: When heated, Bismuth Subsaliolate at first chars, leaving finally a yellow residue, which is blackened by hydrogen sulfide. This residue responds to the tests for bismuth, page 588.

B: Agitate about 0.1 Gm. of Bismuth Subsaliolate with a solution of 5 drops of ferric chloride T.S. in 10 cc. of distilled water: a deep violet blue mixture results.

Loss on drying—When dried over sulfuric acid for 18 hours, Bismuth Subsaliolate loses not more than 3 per cent of its weight.

Alkalies and earths—Mix 2 Gm. of Bismuth Subsalicylate with 40 cc. of a mixture of equal volumes of acetic acid and distilled water, and boil for 2 minutes. Cool the solution, filter, and add 2 cc. of diluted hydrochloric acid to 20 cc. of the filtrate. Precipitate the bismuth by passing hydrogen sulfide through the solution, boil the mixture for 1 minute, and again filter. Add to the filtrate 5 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.

Nitrate—Triturate about 0.05 Gm. of Bismuth Subsalicylate with 0.1 Gm. of sodium salicylate and 5 cc. of distilled water, and superimpose the mixture upon 5 cc. of sulfuric acid: no pink or brownish red color appears at the zone of contact of the two liquids.

Other tests—Ignite 3 Gm. of Bismuth Subsalicylate in a porcelain crucible, cool, and add cautiously, drop by drop, just sufficient nitric acid to dissolve the residue upon warming. Pour the acid solution into 100 cc. of distilled water, filter, evaporate the filtrate on a water bath to 30 cc., again filter, and divide the filtrate into portions of 5 cc. each. These portions severally meet the requirements of the tests for *sulfate, copper, lead, and silver* under *Bismuthi Subcarbonas*, page 87.

Free salicylic acid—Agitate 1 Gm. of Bismuth Subsalicylate with 20 cc. of chloroform, filter the liquid, and evaporate the filtrate to dryness: not more than 5 mg. of residue remains.

Arsenic—Triturate intimately 0.2 Gm. of Bismuth Subsalicylate with an equal weight of calcium hydroxide, and ignite the mixture. Dissolve the residue in 5 cc. of diluted hydrochloric acid: this solution meets the requirements of the test for *arsenic*, page 554.

Assay—Dry about 1 Gm. of Bismuth Subsalicylate over sulfuric acid for 18 hours, and weigh accurately. Ignite in a porcelain crucible, and after cooling, add 5 cc. of nitric acid, drop by drop, to the residue, warming until solution has been effected. Evaporate this solution to dryness, and carefully ignite the residue to constant weight. The weight of Bi_2O_3 so obtained is not less than 62 per cent and not more than 66 per cent of the weight of dried Bismuth Subsalicylate taken for the assay.

Storage—Preserve Bismuth Subsalicylate in well-closed, light-resistant containers.

U. S. P. Product of Bismuth Subsalicylate—Injectio Bismuthi Subsalicylatis.

AVERAGE DOSE—

Gastro-intestinal,

Anti-syphilitic, intramuscular, in oil,

Metric Apothecaries

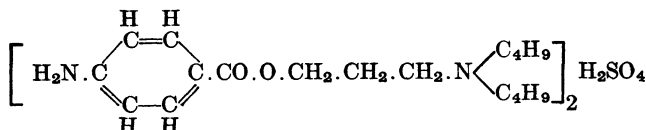
1 Gm.—15 grains.

0.1 Gm.—1½ grains.

BUTACAINÆ SULFAS

Butacaine Sulfate

Butacain. Sulf.



$(\text{C}_{18}\text{H}_{30}\text{N}_2\text{O}_2)_2\text{H}_2\text{SO}_4$

Mol. wt. 710.95

Description—Butacaine Sulfate occurs as a white, odorless, crystalline powder. It is affected by light. It rapidly produces numbness when placed upon the tongue.

Solubility—Butacaine Sulfate dissolves slowly in less than its own weight of water

at 25° C., solution occurring more rapidly upon heating. It is very soluble in warm alcohol and in acetone, is slightly soluble in chloroform, and is insoluble in ether.

Melting point—Butacaine Sulfate melts between 100° and 103° C., page 595.

Identification—

- A: From aqueous solutions of Butacaine Sulfate alkali hydroxides and carbonates precipitate the free base as a colorless oil, while solutions of alkali bicarbonates precipitate a crystalline carbonate of the base.
- B: Separate portions of an aqueous solution of Butacaine Sulfate (1 in 10) yield a white precipitate with mercuric potassium iodide T.S., brown precipitates with iodine T.S. and with gold chloride T.S., and a yellow precipitate with trinitrophenol T.S.
- C: Dissolve about 0.1 Gm. of Butacaine Sulfate in 5 cc. of distilled water, and add 2 drops of diluted hydrochloric acid and 2 drops of an aqueous solution of sodium nitrite (1 in 10), then add the mixture to a solution of 0.2 Gm. of betanaphthol in 10 cc. of an aqueous solution of sodium hydroxide (1 in 10): a scarlet red precipitate is formed (distinction from *phenacaine*, which yields a white precipitate).
- D: An aqueous solution of Butacaine Sulfate (1 in 10) responds to the identity test for sulfate, page 592.

Ash—Butacaine Sulfate yields not more than 0.2 per cent of ash, page 556.

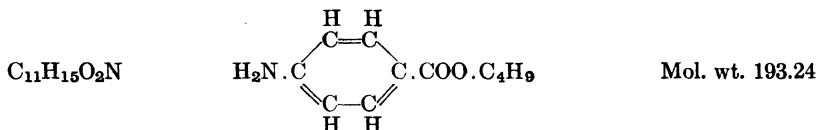
Carbonizable substances—Dissolve 0.1 Gm. of Butacaine Sulfate in 1 cc. of sulfuric acid: the solution is colorless, page 563.

Storage—Preserve Butacaine Sulfate in tight, light-resistant containers.

BUTYLIS AMINO BENZOAS

Butyl Aminobenzoate

Butyl. Aminobenz.—Normal Butyl Aminobenzoate



Description—Butyl Aminobenzoate occurs as a white, crystalline powder. It is odorless and tasteless.

Solubility—One Gm. of Butyl Aminobenzoate dissolves in about 7000 cc. of water at 25° C. It is soluble in dilute acids, in alcohol, in chloroform, in ether, and in fatty oils. It is slowly hydrolyzed when boiled with water.

Melting point—Butyl Aminobenzoate melts between 57° and 59° C., page 595.

Identification—

- A: Add a few drops of an aqueous solution of sodium nitrite (1 in 10) to 2 cc. of a solution of Butyl Aminobenzoate in tenth-normal hydrochloric acid (1 in 100), and add the mixture to a solution of 0.2 Gm. of betanaphthol in 10 cc. of an aqueous solution of sodium hydroxide (1 in 10): a scarlet red precipitate is produced.
- B: To 1 cc. of a solution of Butyl Aminobenzoate in tenth-normal hydrochloric acid (1 in 100) add a few drops of iodine T.S., shake the mixture, and allow it to stand for 10 minutes with occasional shaking: a dark brown precipitate is formed which changes into large, reddish brown prisms (under the same conditions *ethyl aminobenzoate* gives lustrous scales).

Ash—Butyl Aminobenzoate yields not more than 0.15 per cent of ash, page 556.

Chloride—To a solution of 0.2 Gm. of Butyl Aminobenzoate in 10 cc. of alcohol add 1 cc. of diluted nitric acid and a few drops of silver nitrate T.S.: no turbidity is produced.

Sulfate—Dissolve 0.2 Gm. of Butyl Aminobenzoate in 5 cc. of diluted hydrochloric acid, dilute with distilled water to 10 cc., and add 5 drops of barium chloride T.S.: no immediate turbidity is produced.

Heavy metals—Dissolve 1 Gm. of Butyl Aminobenzoate in 2 cc. of diluted acetic acid and sufficient alcohol to make 25 cc.: the heavy metals limit, page 586, for Butyl Aminobenzoate is 10 parts per million.

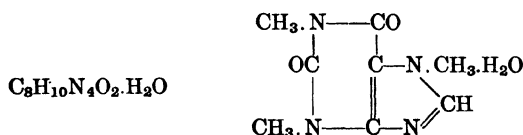
Completeness and color of solution—Butyl Aminobenzoate dissolves completely in alcohol (1 in 30) and in ether (1 in 30), and the solutions are colorless.

Storage—Preserve Butyl Aminobenzoate in well-closed containers.

CAFFEINA

Caffeine

Caff.



$\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2 \cdot \text{H}_2\text{O}$

Mol. wt. 212.21

Description—Caffeine occurs as white, glistening crystals, usually matted together in fleecy masses of slender, flexible needles. It is odorless, has a bitter taste, and is efflorescent in air.

Solubility—One Gm. of Caffeine is soluble in 50 cc. of water, in 70 cc. of alcohol, in 6 cc. of chloroform, and in 550 cc. of ether, at 25° C. One Gm. of it is soluble in 6 cc. of water at 80° C., and in about 22 cc. of alcohol at 60° C.

Melting point—Caffeine, rendered anhydrous by drying at about 80° C., melts between 235° and 237° C., page 595.

Identification—

A: Dissolve about 10 mg. of Caffeine in 1 cc. of hydrochloric acid in a porcelain dish, add 0.1 Gm. of potassium chlorate, and evaporate to dryness on a water bath. Invert the dish over a vessel containing a few drops of ammonia T.S.: the residue acquires a purple color, which disappears upon the addition of a solution of a fixed alkali.

B: A saturated aqueous solution of Caffeine yields, with tannic acid T.S., a precipitate which is soluble in an excess of the reagent.

C: To 5 cc. of a saturated aqueous solution of Caffeine add 5 drops of iodine T.S.: no precipitate is produced. Now add 3 drops of diluted hydrochloric acid: a red-brown precipitate is produced, which redissolves when a slight excess of sodium hydroxide T.S. is added.

Loss on drying—Caffeine loses not more than 9 per cent of its weight when dried to constant weight at 80° C.

Ash—Caffeine yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Caffeine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid D, page 563.

Reaction—A saturated, aqueous solution of Caffeine is neutral to litmus paper.

Heavy metals—Mix 1 Gm. of Caffeine with 5 cc. of tenth-normal hydrochloric acid and 45 cc. of distilled water, and warm gently until solution is complete, then cool to room temperature. Use 25 cc. of this solution for the test: the heavy metals limit, page 586, for Caffeine is 20 parts per million.

Other Alkaloids—No precipitate is produced by mercuric potassium iodide T.S. in an aqueous solution of Caffeine (1 in 50).

Note—In making preparations containing Caffeine, it is permissible to use anhydrous caffeine, provided the product meets all other official tests, and also provided allowance is made for the difference in water content. If such a preparation is labeled with respect to its caffeine content, it shall be in terms of U. S. P. (hydrous) Caffeine.

Storage—Preserve Caffeine in tight containers. Anhydrous caffeine may be preserved in well-closed containers.

U. S. P. Products of Caffeine—Caffeina Citrata, Caffeina et Sodii Benzoas, Injectio Caffeinæ et Sodii Benzoatis.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

CAFFEINA CITRATA

Citrated Caffeine

Caff. Cit.

Citrated Caffeine is a mixture of caffeine and citric acid containing, when dried to constant weight at 80° C., not less than 48 per cent and not more than 52 per cent of anhydrous caffeine ($C_8H_{10}N_4O_2$), and not less than 48 per cent and not more than 52 per cent of anhydrous citric acid ($H_3C_6H_5O_7$). The sum of the percentages of anhydrous caffeine and anhydrous citric acid is not less than 98.5 and not more than 101.

Description—Citrated Caffeine occurs as a white, odorless powder, having a slightly bitter, acid taste.

Solubility—One Gm. of Citrated Caffeine dissolves in 4 cc. of warm water. On diluting the solution with an equal volume of water, a portion of the caffeine gradually separates, but redissolves on the further addition of water.

Melting point—The residue obtained in the *assay for caffeine*, when recrystallized from hot water and dried to constant weight at 80° C., melts between 235° and 237° C., page 595.

Identification—

A: Dissolve about 20 mg. of Citrated Caffeine in 1 cc. of hydrochloric acid in a porcelain dish, add 0.1 Gm. of potassium chlorate, and evaporate to dryness on a water bath. Invert the dish over a vessel containing a few drops of ammonia T.S.: the residue acquires a purple color, which disappears upon the addition of a solution of a fixed alkali.

B: Dissolve about 0.1 Gm. of Citrated Caffeine in 10 cc. of distilled water, and add 1 cc. of calcium chloride T.S. and 3 drops of bromothymol blue T.S. Add tenth-normal sodium hydroxide, drop by drop, until the color of the solution just changes to a clear blue, then boil the solution gently for 3 minutes, agitating it gently during the heating period: a white crystalline precipitate appears in the liquid.

C: Add 1 cc. of mercuric sulfate T.S. to 5 cc. of an aqueous solution of Citrated Caffeine (1 in 100), heat the mixture to boiling, and add 1 cc. of potassium permanganate T.S.: a white precipitate appears in the liquid.

Loss on drying—Citrated Caffeine loses not more than 5 per cent of its weight when dried to constant weight at 80° C.

Ash—Citrated Caffeine yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Citrated Caffeine (1 in 30) is acid to litmus paper.

Sulfate—The addition of a few drops of barium chloride T.S. to 10 cc. of an aqueous solution of Citrated Caffeine (1 in 100), previously treated with 1 drop of hydrochloric acid, produces no turbidity.

Tartrate—Heat a mixture of 0.25 Gm. of Citrated Caffeine and 5 cc. of sulfuric acid in a porcelain dish on a water bath for 15 minutes, protecting it from dust: it may become yellow but not brown or black.

Heavy metals—Dissolve 1 Gm. of Citrated Caffeine in 15 cc. of distilled water, and

dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Citrated Caffeine is 15 parts per million.

Assay for caffeine—Accurately weigh about 1 Gm. of Citrated Caffeine, previously dried to constant weight at 80° C., and dissolve it in 10 cc. of hot distilled water. Add 8 cc. of sodium hydroxide T.S., cool the solution, and shake it in a separator with three or more successive portions of 20 cc. each of chloroform, to effect complete extraction of the caffeine. Filter the combined chloroform solutions through a small filter, previously moistened with chloroform, into a tared dish. Wash the filter and funnel with 10 cc. of hot chloroform, adding the washings to the dish, and evaporate the combined chloroform solutions on a water bath, adding 2 cc. of alcohol just before the last trace of chloroform is expelled. Complete the evaporation of the solvent, and dry the residue, consisting of anhydrous caffeine ($C_8H_{10}N_4O_2$), to constant weight at 80° C.

Assay for citric acid—Weigh accurately about 0.4 Gm. of Citrated Caffeine, previously dried to constant weight at 80° C., and dissolve it in 25 cc. of distilled water. Add 3 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide to a faint pink color. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.006404 Gm. of $H_3C_6H_5O_7$.

Storage—Preserve Citrated Caffeine in well-closed containers.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

CAFFEINA ET SODII BENZOAS

Caffeine and Sodium Benzoate

Caff. et Sod. Benz.—Caffeina cum Sodii Benzoate U. S. P. XI, Caffeine with Sodium Benzoate U. S. P. XI, Caffeine Sodio-Benzoate

Caffeine and Sodium Benzoate is a mixture of caffeine and sodium benzoate which contains, when dried to constant weight at 80° C., not less than 47 per cent and not more than 50 per cent of anhydrous caffeine ($C_8H_{10}N_4O_2$); and not less than 50 per cent and not more than 53 per cent of sodium benzoate ($NaC_7H_5O_2$). The sum of the percentages of anhydrous caffeine and sodium benzoate is not less than 98 and not more than 102.

Description—Caffeine and Sodium Benzoate occurs as a white, odorless powder and has a slightly bitter taste.

Solubility—One Gm. of Caffeine and Sodium Benzoate dissolves in 1.2 cc. of water, a portion of the caffeine usually separating on standing, and in about 30 cc. of alcohol, at 25° C. It is slightly soluble in chloroform.

Identification—

- A: Dissolve about 10 mg. of the caffeine obtained in the assay directed below in 1 cc. of hydrochloric acid in a porcelain dish, add 0.1 Gm. of potassium chlorate, and evaporate to dryness on a water bath. Invert the dish over a vessel containing a few drops of ammonia T.S.: the residue acquires a purple color, which disappears upon the addition of a solution of a fixed alkali.
- B: When heated, Caffeine and Sodium Benzoate decomposes, evolving white vapors of caffeine, and leaving a residue which effervesces when treated with an acid, and imparts an intensely yellow color to a non-luminous flame.
- C: To an aqueous solution of Caffeine and Sodium Benzoate (1 in 10) add a few drops of ferric chloride T.S.: a salmon-colored precipitate appears in

the mixture. To another portion of the solution add diluted hydrochloric acid: a white precipitate is formed.

D: The residue obtained in the *assay for caffeine* directed below, when recrystallized from hot water and dried to constant weight at 80° C., melts between 235° and 237° C., page 595.

Loss on drying—When dried to constant weight at 80° C., Caffeine and Sodium Benzoate loses not more than 3 per cent of its weight.

Carbonizable substances—Dissolve 0.5 Gm. of Caffeine and Sodium Benzoate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 564.

Reaction—An aqueous solution of Caffeine and Sodium Benzoate (1 in 20) may be neutral, slightly acid, or slightly alkaline to litmus paper, but it is not reddened by phenolphthalein T.S.

Chlorinated compounds—Dissolve about 2 Gm. of Caffeine and Sodium Benzoate in 40 cc. of distilled water in a separator, add 10 cc. of diluted sulfuric acid, extract the liberated benzoic acid with two successive 10-cc. portions of ether, and allow the combined ether solutions to evaporate to dryness at room temperature. One-half Gm. of the benzoic acid so obtained meets the requirements of the test for *chlorinated compounds* as directed under *Acidum Benzoicum*, page 17.

Heavy metals—Dissolve 2 Gm. of Caffeine and Sodium Benzoate in 47 cc. of distilled water. Add slowly, with vigorous stirring, 3 cc. of diluted hydrochloric acid, and filter, rejecting the first 5 cc. of filtrate: the heavy metals limit, page 586, for Caffeine and Sodium Benzoate, determined upon 25 cc. of the filtrate, is 20 parts per million.

Assay for caffeine—Weigh accurately about 1 Gm. of Caffeine and Sodium Benzoate, previously dried to constant weight at 80° C., and dissolve it in 10 cc. of distilled water in a separator. Add 1 drop of phenolphthalein T.S. and tenth-normal sodium hydroxide, drop by drop, until a permanent pink color is produced. Shake the mixture with three or more successive portions of 20 cc. each of chloroform to effect complete extraction. Filter the combined chloroform solutions through a small filter, previously moistened with chloroform, into a tared dish. Wash the filter and funnel with 10 cc. of hot chloroform, adding the washings to the dish, and evaporate the combined chloroform solutions on a water bath, adding 2 cc. of alcohol just before the last trace of chloroform is expelled. Complete the evaporation of the solvent, and dry the residue, consisting of anhydrous caffeine ($C_8H_{10}N_4O_2$), to constant weight at 80° C.

Assay for sodium benzoate—Completely transfer the aqueous liquid from which the caffeine has been removed, as directed in the *assay for caffeine*, to a tall beaker of about 300-cc. capacity, and add 75 cc. of ether and 5 drops of methyl orange T.S. Titrate the mixture with tenth-normal hydrochloric acid, mixing the liquids intimately by vigorous stirring, until a permanent orange color is produced in the aqueous layer. Each cc. of tenth-normal hydrochloric acid is equivalent to 0.01441 Gm. of sodium benzoate ($NaC_7H_5O_2$).

Storage—Preserve Caffeine and Sodium Benzoate in well-closed containers.

U. S. P. Product of Caffeine and Sodium Benzoate—*Injectio Caffeinæ et Sodii Benzoatis*.

AVERAGE DOSE—Oral or intramuscular, Metric, 0.5 Gm.—
Apothecaries, 7½ grains.

CALCII CARBONAS PRÆCIPITATUS

Precipitated Calcium Carbonate

Calc. Carb. Præc.—Precipitated Chalk

$CaCO_3$

Mol. wt. 100.09

Precipitated Calcium Carbonate, when dried at 200° C. for 4 hours, contains not less than 98.5 per cent of $CaCO_3$.

UNITED STATES OF AMERICA

Description—Precipitated Calcium Carbonate is a fine, white, microcrystalline powder, without odor or taste. It is stable in air.

Solubility—Precipitated Calcium Carbonate is practically insoluble in water. Its solubility in water is increased by the presence of any ammonium salt and by the presence of carbon dioxide. The presence of any alkali hydroxide reduces its solubility. It is insoluble in alcohol. It dissolves with effervescence in diluted acetic, in diluted hydrochloric, and in diluted nitric acids.

Identification—The addition of acetic acid to Precipitated Calcium Carbonate produces effervescence, and the resulting solution, after boiling to expel carbon dioxide and neutralizing with ammonia T.S., responds to the tests for calcium, page 588.

Loss on drying—When dried at 200° C. for 4 hours, Calcium Carbonate loses not more than 2 per cent of its weight.

Acid-insoluble material—Mix 2 Gm. of Precipitated Calcium Carbonate with 10 cc. of distilled water and add hydrochloric acid, drop by drop, with agitation, until it ceases to cause effervescence. Then add sufficient distilled water to make the mixture measure 100 cc., and filter. Wash the insoluble residue on the filter with distilled water until the last washing shows no chloride, and then ignite it: the weight of the residue does not exceed 4 mg.

Barium—A platinum wire, dipped in the filtrate obtained in the test for *acid-insoluble material* and held in a non-luminous flame, does not impart to the latter a green color.

Heavy metals—Mix 1 Gm. of Precipitated Calcium Carbonate with 5 cc. of distilled water, add slowly 8 cc. of diluted hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 20 cc. of distilled water, and filter; dilute the filtrate to 23 cc. with distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Precipitated Calcium Carbonate is 30 parts per million.

Iron—Boil 0.1 Gm. of Precipitated Calcium Carbonate with 5 cc. of a mixture of 1 volume of nitric acid and 9 volumes of distilled water for 1 minute. Cool, dilute to 50 cc. with distilled water, add 5 cc. of ammonium thiocyanate T.S., mix well, and transfer to a Nessler tube. Treat in the same manner exactly 4 cc. of a solution of ferric ammonium sulfate, made by dissolving 86.5 mg. of ferric ammonium sulfate in 10 cc. of diluted sulfuric acid, and diluting it with distilled water to make 1000 cc., each cc. representing 0.01 mg. of iron, and transfer to a Nessler tube. The color of the solution being tested is not deeper than that of the mixture containing the standard iron solution. The comparison must be made within 5 minutes after the addition of the ammonium thiocyanate T.S.

Magnesium and alkali salts—Dissolve 1 Gm. of Precipitated Calcium Carbonate in a mixture of 20 cc. of distilled water and 10 cc. of diluted hydrochloric acid. Heat to boiling, neutralize with ammonia T.S., and completely precipitate the calcium by the addition of ammonium oxalate T.S. Heat the mixture on a water bath for 1 hour, cool, dilute to 100 cc. with distilled water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness in a platinum dish of about 75 cc. capacity. Ignite to constant weight: the weight of the residue does not exceed 5 mg.

Assay—Dry about 0.25 Gm. of Precipitated Calcium Carbonate at 200° C. for 4 hours, weigh accurately, dissolve it in a mixture of 10 cc. of diluted hydrochloric acid and 10 cc. of distilled water in a 250-cc. beaker, and boil the solution to expel all carbon dioxide. Add 100 cc. of distilled water, heat the mixture to boiling, make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat the mixture on a water bath during 1 hour, filter through hardened filter paper, and wash thoroughly with warm distilled water. Puncture the filter paper, and wash the precipitate into a beaker by means of hot distilled water, followed by 30 cc. of dilute sulfuric acid (1 in 3). Heat the solution to 80° C. and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.005005 Gm. of CaCO_3 .

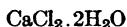
Storage—Preserve Precipitated Calcium Carbonate in well-closed containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

CALCII CHLORIDUM

Calcium Chloride

Calc. Chlorid.



Mol. wt. 147.03

Calcium Chloride contains not less than 75 per cent and not more than 81 per cent of CaCl_2 .

Description—Calcium Chloride occurs as white, hard, odorless fragments or granules. It is deliquescent.

Solubility—One Gm. of Calcium Chloride is soluble in 1.2 cc. of water, and in about 10 cc. of alcohol, at 25° C. One Gm. of it is soluble in 0.7 cc. of boiling water, and in about 2 cc. of boiling alcohol.

Identification—An aqueous solution of Calcium Chloride (1 in 10) responds to the tests for calcium, page 588, and for chloride, page 589.

Reaction—An aqueous solution of Calcium Chloride (1 in 20) is neutral, or slightly alkaline, or slightly acid to litmus paper.

Iron, aluminum, or phosphate—Add enough ammonia T.S. to an aqueous solution of Calcium Chloride (1 in 20) to render it alkaline, and heat the liquid to boiling: no turbidity or precipitate is produced.

Magnesium and alkali salts—Dissolve 1 Gm. of Calcium Chloride in about 40 cc. of distilled water, and add 0.5 Gm. of ammonium chloride. Heat the solution to boiling, and add ammonium oxalate T.S. to precipitate the calcium completely. Heat on a water bath for 1 hour, cool, dilute to 100 cc. with distilled water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.

Heavy metals—Dissolve 1 Gm. of Calcium Chloride in 2 cc. of diluted acetic acid, and add sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Calcium Chloride is 20 parts per million.

Assay—Dissolve about 0.2 Gm. of Calcium Chloride, accurately weighed in a tared, glass-stoppered weighing bottle, in about 100 cc. of distilled water, and proceed with the assay as directed under *Calcii Carbonas Præcipitatus*, page 96, beginning with the words "heat the mixture to boiling, make the solution alkaline with ammonia T.S.," etc. Each cc. of tenth-normal potassium permanganate is equivalent to 0.00555 Gm. of CaCl_2 .

Storage—Preserve Calcium Chloride in tight containers.

U. S. P. Product of Calcium Chloride—Liquor Chloridum Trium Isotonieus.

AVERAGE DOSE—Intravenous, Metric, 1 Gm.—Apothecaries, 15 grains.

CALCII GLUCONAS

Calcium Gluconate

Calc. Glucon.



Mol. wt. 448.39

Calcium Gluconate contains not less than 8.8 per cent and not more than 9.3 per cent of calcium (Ca), corresponding to not less than 99 per cent of $\text{Ca}(\text{C}_6\text{H}_{11}\text{O}_7)_2 \cdot \text{H}_2\text{O}$.

Description—Calcium Gluconate occurs as a white, crystalline or granular powder without odor or taste. It is stable in air.

Solubility—One Gm. of Calcium Gluconate dissolves slowly in about 30 cc. of water at 25° C., and in about 5 cc. of boiling water. It is insoluble in alcohol and in many other organic solvents.

Identification—

A: An aqueous solution of Calcium Gluconate (1 in 50) responds to the tests for calcium, page 588.

B: To 5 cc. of a warm aqueous solution of Calcium Gluconate (1 in 10) add 0.65 cc. of glacial acetic acid and 1 cc. of freshly distilled phenylhydrazine, and heat the mixture on a water bath for 30 minutes; allow it to cool, and scratch the inner surface of the tube with a glass stirring rod. Crystals of gluconic-acid-phenylhydrazide form.

Reaction—An aqueous solution of Calcium Gluconate (1 in 50) is neutral to litmus paper.

Chloride—One Gm. of Calcium Gluconate shows no more *chloride* than corresponds to 1 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 2-Gm. portion of Calcium Gluconate shows no more *sulfate* than corresponds to 1 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—Dissolve 0.25 Gm. of Calcium Gluconate in 5 cc. of warm distilled water, add 5 cc. of diluted sulfuric acid and 1 cc. of bromine T.S., and heat for 5 minutes on a water bath: the solution meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Mix 1 Gm. of Calcium Gluconate with 4 cc. of normal hydrochloric acid, dilute to 25 cc. with distilled water, warm gently until dissolved, and cool to room temperature: the heavy metals limit, page 586, for Calcium Gluconate is 20 parts per million.

Sucrose and reducing sugars—Dissolve 0.5 Gm. of Calcium Gluconate in 10 cc. of hot distilled water, add 2 cc. of diluted hydrochloric acid, and boil the solution for about 2 minutes. Cool, add 5 cc. of sodium carbonate T.S., allow to stand for 5 minutes, then dilute to 20 cc. with distilled water, and filter. Add 5 cc. of the clear filtrate to about 2 cc. of alkaline cupric tartrate T.S., and boil for 1 minute: no red precipitate is formed.

Assay—Weigh accurately about 0.5 Gm. of Calcium Gluconate, place it in a 250-cc. beaker, and add 2 cc. of hydrochloric acid and 100 cc. of distilled water. Heat the mixture to boiling, make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat the mixture on a water bath during 1 hour, filter through hardened filter paper, and wash thoroughly with warm distilled water. Puncture the filter paper, wash the precipitate into a beaker by means of a stream of hot distilled water, followed by 30 cc. of dilute (1 in 3) sulfuric acid. Heat the solution to 80° C., and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.002004 Gm. of Ca.

Storage—Preserve Calcium Gluconate in well-closed containers.

U. S. P. Product of Calcium Gluconate—Injectio Calcii Gluconatis.

Metrie Apothecaries

AVERAGE DOSE—Oral, 5 Gm.—75 grains.

Intravenous, 1 Gm.—15 grains.

CALCII HYDROXIDUM

Calcium Hydroxide

Calc. Hydrox.—Slaked Lime, Calcium Hydrate

Ca(OH)_2

Mol. wt. 74.10

Calcium Hydroxide contains not less than 95 per cent of Ca(OH)_2 .

THE PHARMACOPŒIA OF THE

Description—Calcium Hydroxide occurs as a soft, white, crystalline powder, possessing an alkaline, slightly bitter taste.

Solubility—One Gm. of Calcium Hydroxide dissolves in 630 cc. of water at 25° C. and in 1300 cc. of boiling water. It is soluble in glycerin and in syrup, but is insoluble in alcohol.

Identification—

A: When mixed with from 3 to 4 times its weight of water, Calcium Hydroxide forms a smooth magma (milk of lime). The clear, supernatant liquid from the magma is distinctly alkaline to litmus paper.

B: Dissolve 1 Gm. of Calcium Hydroxide in 20 cc. of distilled water by the addition of sufficient acetic acid to effect solution: the resulting solution responds to the tests for calcium, page 588.

Hydrochloric acid-insoluble matter—Dissolve 2 Gm. of Calcium Hydroxide in 10 cc. of hydrochloric acid, previously mixed with 26 cc. of distilled water, and heat to boiling. Filter the mixture, wash the residue with hot distilled water, and ignite: the weight of the residue does not exceed 10 mg.

Carbonate—Thoroughly mix 2 Gm. of Calcium Hydroxide with 50 cc. of distilled water: the addition of an excess of diluted hydrochloric acid to the mixture does not cause more than a slight effervescence.

Heavy metals—Dissolve 1 Gm. of Calcium Hydroxide in 10 cc. of diluted hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 20 cc. of distilled water, and filter. Add 1 cc. of tenth-normal hydrochloric acid and sufficient distilled water to make 25 cc.: the heavy metals limit, page 586, for Calcium Hydroxide is 40 parts per million.

Magnesium—Dissolve 0.5 Gm. of Calcium Hydroxide in 20 cc. of distilled water and 10 cc. of diluted hydrochloric acid. Neutralize with ammonia T.S., heat to boiling, and add ammonium oxalate T.S. to precipitate the calcium completely. Heat the mixture on a steam bath for 1 hour, cool, dilute to 100 cc. with distilled water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 12 mg.

Assay—Dissolve about 0.3 Gm. of Calcium Hydroxide, accurately weighed, in 10 cc. of diluted hydrochloric acid, and proceed with the assay as directed under *Calcii Carbonas Præcipitatus*, page 95, beginning with the words "Add 100 cc. of distilled water," etc. Each cc. of tenth-normal potassium permanganate is equivalent to 0.003705 Gm. of $\text{Ca}(\text{OH})_2$.

Storage—Preserve Calcium Hydroxide in tight containers.

U. S. P. Product of Calcium Hydroxide—Liquor Calcii Hydroxidi.

CALCII IODOBEHENAS

Calcium Iodobehenate

Calc. Iodobehen.—Calcium Monoiodobehenate

Calcium Iodobehenate consists principally of calcium monoiodobehenate $[(\text{C}_{21}\text{H}_{42}\text{ICOO})_2\text{Ca}]$ and contains, when dried at 100° C. for 2 hours, not less than 23.5 per cent of I.

Description—Calcium Iodobehenate occurs as a white or yellowish powder, which is unctuous to the touch. It is odorless or has a slight odor suggestive of fat. It is affected by light.

Solubility—Calcium Iodobehenate is insoluble in water, very slightly soluble in alcohol and in ether, and freely soluble in warm chloroform.

Loss on drying—Calcium Iodobehenate loses not more than 2 per cent of its weight when dried to constant weight at 100° C.

Identification—When strongly heated, Calcium Iodobehenate decomposes, yielding

violet vapors of iodine, and white vapors having the odor of burning fat. The residue of ash, dissolved in diluted hydrochloric acid, boiled to expel carbon dioxide, and neutralized with ammonia T.S., responds to the tests for calcium, page 588.

Magnesium and alkali salts—To 1 Gm. of Calcium Iodobehenate add 10 cc. of diluted hydrochloric acid and 40 cc. of distilled water, and boil gently: a layer of fatty acid, which is soluble in ether and in chloroform, separates on the surface. Separate the aqueous layer, make it slightly alkaline with ammonia T.S., and add an excess of ammonium oxalate T.S. (about 5 cc.): a white precipitate of calcium oxalate appears in the liquid. Allow to stand for 4 hours, filter, evaporate the filtrate to dryness, and ignite: the weight of the residue does not exceed 3 mg.

Carbonate—Add 10 cc. of diluted hydrochloric acid to 1 Gm. of Calcium Iodobehenate: the mixture does not effervesce.

Soluble salts—Triturate 1 Gm. of Calcium Iodobehenate with 10 cc. of distilled water: the mixture is neutral to litmus paper. Add 15 cc. more of distilled water, mix well during 5 minutes, and filter. Evaporate 10 cc. of the filtrate to dryness on a water bath, and dry to constant weight at 120° C.: the weight of the residue does not exceed 1 mg.

Chloride and sulfate—Separate 5-cc. portions of the filtrate obtained from the test for *soluble salts*, when tested for *chloride* (page 626) and *sulfate* (page 626), produce no more turbidity than does 0.1 cc. of fiftieth-normal hydrochloric acid, or 0.1 cc. of fiftieth-normal sulfuric acid, respectively.

Inorganic salts—1 Gm. of Calcium Iodobehenate dissolves in 10 cc. of warm chloroform with not more than an opalescence.

Assay for iodine—Mix about 0.5 Gm. of Calcium Iodobehenate, previously dried at 100° C. for 2 hours and accurately weighed, with about 3 Gm. of anhydrous potassium carbonate. Place the mixture in a platinum crucible, cover it with about 1 Gm. more of anhydrous potassium carbonate, and heat it moderately, gradually increasing the temperature, but not making the mass brighter than dull red, until the mixture is completely carbonized. Extract the residue with boiling distilled water, and wash it on a filter with boiling distilled water until the last washing produces no opalescence with silver nitrate T.S. Heat the combined filtrate and washings, which measure about 150 cc., on a water bath, and add an aqueous solution of potassium permanganate (1 in 20) in small portions, until the hot liquid remains permanently pink. Add just enough alcohol to remove the pink tint, cool to room temperature, dilute to 200 cc., mix well, and filter through a filter, which has not been previously moistened, rejecting the first 50 cc. of filtrate. To 100 cc. of the subsequent clear filtrate add about 1 Gm. of potassium iodide (free from iodate) and an excess of diluted sulfuric acid, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. as the indicator near the end of the titration. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.002115 Gm. of I.

Storage—Preserve Calcium Iodobehenate in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 0.5 Gm.—Apothecaries, 7½ grains.

CALCH LACTAS

Calcium Lactate

Calc. Lact.

$\text{Ca}(\text{C}_3\text{H}_5\text{O}_3)_2 \cdot 5\text{H}_2\text{O}$

Mol. wt. 308.30

Calcium Lactate is a hydrated salt containing not less than 25 per cent and not more than 30 per cent of water. When rendered anhydrous by drying to constant weight at 120° C., it contains not less than 98 per cent of $(\text{CH}_3 \cdot \text{CHOH} \cdot \text{COO})_2\text{Ca}$.

Description—Calcium Lactate is a white, almost odorless powder. It is somewhat efflorescent and at 120° C. becomes anhydrous.

Solubility—One Gm. of Calcium Lactate dissolves in 20 cc. of water at 25° C. It is practically insoluble in alcohol.

Identification—An aqueous solution of Calcium Lactate (1 in 20) responds to the tests for calcium, page 588 and for lactate, page 590.

Loss on drying—Calcium Lactate loses not less than 25 per cent and not more than 30 per cent of its weight while being dried to constant weight at 120° C.

Free acid—A solution of 1 Gm. of Calcium Lactate in 20 cc. of distilled water requires not more than 0.5 cc. of tenth-normal sodium hydroxide for neutralization, using phenolphthalein T.S. as the indicator.

Heavy metals—Dissolve 1 Gm. of Calcium Lactate in 2.5 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Calcium Lactate is 15 parts per million.

Magnesium and alkali salts—Dissolve 1 Gm. of Calcium Lactate in about 40 cc. of distilled water, and add 0.5 Gm. of ammonium chloride. Heat the solution to boiling, and add ammonium oxalate T.S. to precipitate the calcium completely. Heat on a water bath for 1 hour, cool, dilute to 100 cc. with distilled water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight. The weight of the residue does not exceed 5 mg.

Volatile fatty acid—Stir about 0.5 Gm. of Calcium Lactate with 1 cc. of sulfuric acid, and warm: the mixture does not emit an odor of volatile fatty acid.

Assay—Dry about 0.5 Gm. of Calcium Lactate to constant weight at 120° C., place it in a 250-cc. beaker, and add 2 cc. of hydrochloric acid and 100 cc. of distilled water. Heat the mixture to boiling, make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat the mixture on a water bath for 1 hour, filter through hardened filter paper, and wash thoroughly with warm distilled water. Puncture the filter paper, wash the precipitate into a beaker by means of a stream of hot distilled water, followed by 30 cc. of dilute sulfuric acid (1 in 3). Heat the solution to 80° C., and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.01091 Gm. of $\text{Ca}(\text{C}_3\text{H}_5\text{O}_3)_2$.

Storage—Preserve Calcium Lactate in tight containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

CALCI MANDELAS

Calcium Mandelate

Calc. Mandel.

$\text{Ca}(\text{C}_8\text{H}_7\text{O}_3)_2$

Mol. wt. 342.35

Calcium Mandelate, when dried for 4 hours at 110° C., contains not less than 98.5 per cent of $(\text{C}_6\text{H}_5.\text{CHOH}.\text{COO})_2\text{Ca}$.

Description—Calcium Mandelate occurs as a white, odorless powder.

Solubility—Calcium Mandelate is slightly soluble in cold water and insoluble in alcohol. One Gm. dissolves in about 80 cc. of boiling water.

Identification—Dissolve 2 Gm. of Calcium Mandelate in about 160 cc. of boiling distilled water, then add, in small portions and with stirring, a solution of 0.82 Gm. of reagent oxalic acid dissolved in 10 cc. of warm distilled water. Evaporate the mixture to about 75 cc. and filter. Evaporate the filtrate to about 5 cc., refilter while hot, if necessary, and place the filtrate in the refrigerator for 2 hours. Filter out the crystals of mandelic acid with suction, wash with two 1-cc. portions of ice-

cold distilled water, and dry at about 80° C. The mandelic acid so obtained melts between 118° and 120° C., and responds to *identification tests A and B* under *Acidum Mandelicum*, page 24.

Loss on drying—When dried for 4 hours at 110° C. Calcium Mandelate loses not more than 1 per cent of its weight.

Completeness and clarity of solution—One Gm. of Calcium Mandelate dissolves completely in 100 cc. of boiling distilled water, and the resulting solution is colorless.

Free Acid—A solution of 1 Gm. of Calcium Mandelate in 100 cc. of boiling distilled water requires not more than 0.5 cc. of tenth-normal sodium hydroxide for neutralization, using phenolphthalein T.S. as indicator.

Chloride—A solution of 1 Gm. of Calcium Mandelate in a mixture of 40 cc. of distilled water and 3 cc. of nitric acid shows no more *chloride* than corresponds to 0.3 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Mix 1 Gm. of Calcium Mandelate with 40 cc. of distilled water, heat the mixture and add hydrochloric acid, drop by drop, until the Calcium Mandelate has dissolved, then add 3 drops more of the acid. This solution shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Heat 1 Gm. of Calcium Mandelate with 15 cc. of distilled water, and add diluted hydrochloric acid, drop by drop, until dissolved. Cool the solution, add one drop of phenolphthalein T.S., then add ammonia T.S. until a slight pink color is produced. Add 1 cc. of normal hydrochloric acid and dilute to 25 cc. with distilled water, cool well, filter, and use the filtrate for the test: the heavy metals limit, page 586, for Calcium Mandelate is 30 parts per million.

Magnesium and alkali salts—Heat 1 Gm. of Calcium Mandelate with 50 cc. of distilled water, and add hydrochloric acid until dissolved, then add 3 cc. more of the acid. Make the solution alkaline with ammonia T.S., heat to boiling and completely precipitate the calcium by the addition of a moderate excess of ammonium oxalate T.S. (about 20 cc.). Heat the mixture on a water bath for 1 hour, cool, dilute with distilled water to 100 cc., mix well and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness and ignite to constant weight. The weight of the residue so obtained does not exceed 10 mg.

Assay—Weigh accurately about 0.5 Gm. of Calcium Mandelate, previously dried for 4 hours at 110° C., and dissolve it in 75 cc. of hot distilled water by the addition of 3 cc. of hydrochloric acid. Heat the solution to boiling, make it alkaline with ammonia T.S. and add, in small portions and with stirring, an excess of hot ammonium oxalate T.S. (about 10 cc.). Heat the mixture on a steam bath for 1 hour, then filter through a hardened filter paper, and wash the precipitate thoroughly with warm distilled water. Puncture the filter, wash the precipitate into a beaker with a stream of hot distilled water, followed by 30 cc. of dilute sulfuric acid (1 in 3). Heat the solution to 80° C. and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.01712 Gm. of $\text{Ca}(\text{C}_6\text{H}_7\text{O}_3)_2$.

Storage—Preserve Calcium Mandelate in well-closed containers.

AVERAGE DOSE—Metric, 4 Gm.—Apothecaries, 60 grains.

CALCII PHOSPHAS TRIBASICUS

Tribasic Calcium Phosphate

Calc. Phos. Tribas.—Precipitated Calcium Phosphate

Tribasic Calcium Phosphate, after ignition to constant weight, contains an amount of phosphate (PO_4) corresponding to not less than 90 per cent of $\text{Ca}_3(\text{PO}_4)_2$ (310.20).

Description—Tribasic Calcium Phosphate occurs as a white, odorless, and tasteless powder, which is permanent in air.

Solubility—Tribasic Calcium Phosphate is almost insoluble in water but dissolves readily in diluted hydrochloric and nitric acids. It is insoluble in alcohol.

Identification—Ammonium molybdate T.S. added in excess to a solution of Tribasic Calcium Phosphate in diluted nitric acid, precipitates yellow ammonium phosphomolybdate; gentle heating hastens the precipitation. Tribasic Calcium Phosphate gives the flame test characteristic of calcium.

Loss on ignition—Tribasic Calcium Phosphate loses not more than 8 per cent in weight on ignition.

Acid-insoluble matter—If an insoluble residue remains in the test below for *carbonate*, filter the solution, wash well with hot distilled water until the last washing is free from chloride, and ignite the residue to constant weight: it weighs not more than 4 mg.

Soluble salts—Digest 2 Gm. of Tribasic Calcium Phosphate with 100 cc. of distilled water for 30 minutes on a steam bath, cool, add sufficient distilled water to restore the original volume, stir well, and filter. Evaporate to dryness 50 cc. of the filtrate in a porcelain dish on a steam bath, and gently ignite the residue to constant weight: the weight of the residue does not exceed 5 mg.

Carbonate—Mix 2 Gm. of Tribasic Calcium Phosphate with 20 cc. of distilled water, and add diluted hydrochloric acid, drop by drop, to effect solution: no effervescence occurs when the acid is added.

Chloride—Dissolve 0.5 Gm. of Tribasic Calcium Phosphate in 25 cc. of diluted nitric acid, and add 1 cc. of silver nitrate T.S.: the turbidity is no greater than that produced by 1 cc. of fiftieth-normal hydrochloric acid, page 626.

Nitrate—Mix 0.2 Gm. of Tribasic Calcium Phosphate with 5 cc. of distilled water, and add just sufficient hydrochloric acid to effect solution. Dilute with distilled water to 10 cc., add 0.1 cc. of indigo carmine T.S., then add, with stirring, 10 cc. of sulfuric acid: the blue color persists for at least 5 minutes.

Sulfate—Dissolve 0.5 Gm. of Tribasic Calcium Phosphate in the smallest possible amount of diluted hydrochloric acid, dilute to 100 cc. with distilled water, filter if necessary, and to 25 cc. of the filtrate add 1 cc. of barium chloride T.S.: the turbidity is not greater than that produced by 1 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—A 5-cc. portion of a solution of Tribasic Calcium Phosphate (1 in 25) in diluted hydrochloric acid meets the requirements of the test for *arsenic*, page 554, omitting the preliminary treatment with sulfurous and sulfuric acids.

Barium—Mix 0.5 Gm. of Tribasic Calcium Phosphate with 10 cc. of distilled water, heat, and add hydrochloric acid, drop by drop, until solution is effected, then add 2 drops of the acid in excess. Filter, and add to the filtrate 1 cc. of potassium sulfate T.S.: no turbidity appears within 15 minutes.

Dibasic salt and calcium oxide—Weigh accurately about 2 Gm. of Tribasic Calcium Phosphate, and dissolve it by warming with 50 cc. of normal hydrochloric acid. Cool, add 1 or 2 drops of methyl orange T.S., and slowly titrate the excess of normal hydrochloric acid with normal sodium hydroxide to a yellow color, vigorously shaking the mixture during titration. Not less than 12.5 cc. and not more than 13.8 cc. of normal hydrochloric acid is consumed for each Gm. of salt, calculated on a water-free basis.

Fluorine—Place 2 Gm. of Tribasic Calcium Phosphate, 5 cc. of perchloric acid, 15 cc. of distilled water, and a few glass beads in a 50-cc. distilling flask connected with a condenser and carrying a thermometer and a capillary tube, both of which must extend into the liquid. Connect a small dropping funnel, filled with distilled water, to the capillary tube. Support the flask on an asbestos mat with a hole which exposes about one-third of the flask to the flame. Distil until the temperature reaches 135° C., receiving the distillate under the surface of a few cc. of distilled water; then maintain at from 135° to 140° C. by adding distilled water from the funnel. Continue the distillation until 70 cc. has been collected, dilute the distillate to 80 cc., and mix well. Place 40 cc. of the solution in a 50-cc. Nessler tube. In another similar Nessler tube, place 40 cc. of distilled water as a control. Add

to each tube 0.1 cc. of sodium alizarinsulfonate T.S., and mix well. Add, drop by drop, and with stirring, twentieth-normal sodium hydroxide to the tube containing the distillate until its color just matches that of the control, which is faintly pink. Then add to each tube exactly 1 cc. of tenth-normal hydrochloric acid, and mix well. From a burette, graduated in 0.05 cc., add slowly to the tube containing the distillate enough reagent thorium nitrate solution, made by dissolving 0.25 Gm. of thorium nitrate in 1000 cc. of distilled water, so that, after mixing, the color of the liquid just changes to a faint pink. Note the volume of thorium nitrate solution added, add exactly the same volume to the control, and mix. Now add to the control sodium fluoride T.S. from a burette to make the colors of the two tubes match after dilution to the same volume. Mix well, and allow all air bubbles to escape before making the final color comparison. Check the end-point by adding 1 or 2 drops of sodium fluoride T.S. to the control: a distinct change in color should take place. Not more than 5 cc. of the sodium fluoride T.S. is required. Each cc. of sodium fluoride T.S. is equivalent to 0.01 mg. of fluorine (F).

Heavy metals—Mix thoroughly 2 Gm. of Tribasic Calcium Phosphate with 9 cc. of diluted hydrochloric acid, dilute to 50 cc. with distilled water, and heat to boiling. Cool to room temperature, and filter. Use 25 cc. of the filtrate for the test: the heavy metals limit, page 586, for Tribasic Calcium Phosphate is 30 parts per million.

Assay—Weigh accurately about 0.2 Gm. of Tribasic Calcium Phosphate, previously ignited to constant weight, and dissolve it in a mixture of 25 cc. of distilled water and 10 cc. of diluted nitric acid. Filter, wash any precipitate, add sufficient ammonia T.S. to the filtrate to produce a slight precipitate, then dissolve the precipitate by the addition of 1 cc. of diluted nitric acid. Cool or heat the solution as necessary to about 50° C., add 75 cc. of ammonium molybdate T.S., and maintain the temperature at about 50° C. for 30 minutes, stirring occasionally. Wash the precipitate once or twice with distilled water by decantation, using from 30 to 40 cc. each time. Transfer the precipitate to a filter, and wash with cold distilled water until the last washing is not acid to litmus paper. Transfer the precipitate and filter to the precipitating vessel, add 30 cc. of normal sodium hydroxide, agitate until the precipitate is dissolved, and then titrate the excess of alkali with half-normal sulfuric acid, using 3 drops of phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide corresponds to 0.006745 Gm. of $\text{Ca}_3(\text{PO}_4)_2$.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

CALX SODICA

Soda Lime

Calx. Sod.

Soda Lime for use in metabolism, anesthesia, and oxygen therapy contains calcium hydroxide and sodium or potassium hydroxide or both in granular form.

Soda Lime is available in two forms, *Low-moisture* Soda Lime which contains less than 9 per cent of moisture and *High-moisture* Soda Lime which contains not less than 9 per cent and not more than 19 per cent of moisture.

Soda Lime may contain an indicator which is inert with respect to its reactivity with ether, nitrous oxide, ethylene, and cyclopropane, and which changes color when the absorption capacity of the Soda Lime for

carbon dioxide is exhausted. When present, the nature and color change of the indicator must be stated on the label of the container.

Description—Soda Lime is white or grayish white, or if an indicator is added the Soda Lime may have a color.

Size of granules—Soda Lime passes completely through a No. 2 standard mesh sieve, and not more than 2 per cent passes through a No. 40 standard mesh sieve.

The label should indicate the mesh of the Soda Lime. Not more than 10 per cent passes through the finer mesh indicated on the label.

Identification—

- A: Place a granule of Soda Lime on a piece of moist litmus paper; the paper turns blue immediately.
- B: Crush a few granules of Soda Lime and dissolve about 0.2 Gm. of the powder in acetic acid: the solution responds to the test for calcium, page 588.
- C: The solution obtained in *identification test "B"* imparts a yellow color to a non-luminous flame, which when viewed through cobalt glass may show a violet tint.

Moisture absorption—

- A: *Low-moisture Soda Lime*—Place 10 Gm. of Soda Lime in a 50-cc. weighing bottle, having a diameter of 50 mm. and a height of 30 mm. Place the bottle and contents in a desiccator over a sulfuric acid having a specific gravity of 1.16 (relative humidity 85 per cent), and allow the weighing bottle to remain uncovered for 24 hours. Weigh the bottle and contents: the increase in weight does not exceed 0.75 Gm.
- B: *High-moisture Soda Lime*—Proceed as directed under *moisture absorption test A*: the increase in weight does not exceed 0.3 Gm.

Loss on drying—

- A: *Low-moisture Soda Lime*—Weigh accurately in a tared crucible about 10 Gm. of Low-Moisture Soda Lime. Dry for 2 hours at 110° C. and weigh: the loss in weight does not exceed 9 per cent.
- B: *High-moisture Soda Lime*—Proceed as directed under *loss on drying, test A*: the loss in weight is not less than 9 per cent and not more than 19 per cent.

Carbon dioxide absorption capacity—Soda Lime absorbs not less than 22 per cent of its weight of carbon dioxide, when determined as directed under *Carbon Dioxide Absorbency of Soda Lime*, page 561.

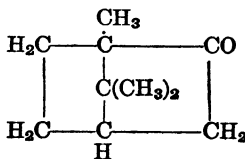
Hardness—Soda Lime conforms to the test for *Hardness of Soda Lime*, page 585.

Storage—Preserve Soda Lime in tight containers holding not more than 2.5 Kilograms.

CAMPHORA

Camphor

Camph.



$\text{C}_{10}\text{H}_{16}\text{O}$

Mol. wt. 152.23

Camphor is a ketone obtained from *Cinnamomum Camphora* (Linné) Nees et Ebermaier (Fam. *Lauraceæ*) (Natural Camphor) or produced synthetically (Synthetic Camphor).

Description—Camphor occurs as colorless or white crystals, granules, or crystalline masses; or as colorless to white, translucent, tough masses. It has a penetrating, characteristic odor, a pungent, aromatic taste, and is readily pulverizable in the presence of a little alcohol, ether, or chloroform. It slowly volatilizes at ordinary temperatures.

Solubility—One Gm. of Camphor dissolves in about 800 cc. of water, in 1 cc. of alcohol, in about 0.5 cc. of chloroform, and in 1 cc. of ether, at 25° C. It is freely soluble in carbon disulfide, in purified benzin, and in fixed and volatile oils.

Specific gravity—The specific gravity of Camphor is about 0.990 at 25° C.

Melting point—Camphor melts between 175° and 179° C., Class II, page 595.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Natural Camphor, determined in a solution containing 10 Gm. of Camphor in sufficient alcohol to make 100 cc. and using a 200-mm. tube, is between +41° and +43°, page 601.

Moisture—A solution of Camphor in petroleum benzin (1 in 10) is clear.

Non-volatile matter—Gradually heat 2.0 Gm. of Camphor: it sublimes without carbonization and without leaving more than 0.05 per cent of non-volatile matter.

Halogens—Mix 0.1 Gm. of finely divided Camphor with 0.2 Gm. of sodium peroxide in a clean, dry, hard glass test tube of about 25 mm. internal diameter and 20 cm. length. Suspend the tube at an angle of about 45° by means of a clamp placed at the upper end, and gently heat the tube, starting at the upper end and gradually bringing the heat toward the lower part of the tube until incineration is complete. Dissolve the residue in 25 cc. of warm distilled water, acidify with nitric acid, and filter the solution into a comparison tube. Wash the test tube and filter with two portions of 10 cc. each of hot distilled water, adding the washings to the filtered solution. Add to the filtrate 0.5 cc. of tenth-normal silver nitrate, dilute with distilled water to 50 cc., and mix thoroughly. The turbidity is no greater than that produced in a control test with the same quantities of the same reagents and 0.05 cc. of fiftieth-normal hydrochloric acid.

Storage—Preserve Camphor in tight containers, and avoid exposure to excessive heat.

U. S. P. Products of Camphor—Aqua Camphoræ, Linimentum Camphoræ, Linimentum Camphoræ et Saponis, Linimentum Chloroformi, Spiritus Camphoræ, Tinctura Opii Camphorata.

AVERAGE DOSE—Oral or intramuscular, Metric, 0.2 Gm.—
Apothecaries, 3 grains.

CAPSULÆ AMMONII CHLORIDI

Ammonium Chloride Capsules

Cap. Ammon. Chlorid.

Ammonium Chloride Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of ammonium chloride (NH_4Cl), including all tolerances (see page 2).

Identification—Dissolve the contents of a sufficient number of Ammonium Chloride Capsules in distilled water to yield 20 cc. of a 1 in 50 solution. This solution responds to the tests for ammonium, page 587, and for chloride, page 589.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 Ammonium Chloride Capsules to a 500-cc. volumetric flask. Place the emptied capsules in a beaker, add sufficient cold distilled water to cover them, and agitate for 5 minutes. Filter into the flask, wash the beaker and the filter well with cold distilled water, receiving the washings in the same flask, then add distilled water to make exactly 500 cc., and mix well. Transfer an accurately measured

aliquot of the solution, equivalent to about 0.2 Gm. of ammonium chloride, to a distilling flask connected with a distillation trap to a well-cooled condenser which dips into a vessel containing 50 cc. of tenth-normal sulfuric acid, accurately measured. Add to the flask 150 cc. of distilled water and 20 cc. of 10 per cent sodium hydroxide solution, and distil over about 150 cc. Then titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 0.005350 Gm. of NH_4Cl .

Sizes—Ammonium Chloride Capsules usually available contain the following amounts of ammonium chloride: 0.3 and 0.5 Gm. (5 and $7\frac{1}{2}$ grains).

AVERAGE DOSE OF AMMONIUM CHLORIDE—Metric, 1 Gm.—
Apothecaries, 15 grains.

CAPSULÆ CARBONEI TETRACHLORIDI

Carbon Tetrachloride Capsules

Cap. Carbon. Tetrachlor.

Carbon Tetrachloride Capsules contain not less than 92 per cent and not more than 108 per cent of the labeled amount of carbon tetrachloride (CCl_4), including all tolerances (see page 2).

Identification—Shake the carbon tetrachloride obtained in the assay with about 1 Gm. of anhydrous sodium sulfate, and filter through a pledget of dry cotton into a dry flask. The filtrate has a specific gravity of 1.588 to 1.590 at 25°C ., and all of it distills between 75° and 78°C .

Assay—Place in the flask of a toluene moisture apparatus, page 629, having a graduated receiving tube of 20-cc. capacity, a sufficient number of Carbon Tetrachloride Capsules to yield about 15 cc. of carbon tetrachloride. Add 25 cc. of glycerin, and heat the flask over a small flame until the lower layer in the receiving tube does not increase. Cool the receiving tube to 25°C ., and adjust the meniscus if necessary, by washing the walls with a spray of about 2 cc. of distilled water. The volume of the lower layer represents the volume of carbon tetrachloride in the number of Capsules taken for the assay.

Storage—Preserve Carbon Tetrachloride Capsules in well-closed containers, at a temperature which does not exceed 35°C .

Sizes—Carbon Tetrachloride Capsules usually available contain the following amount of carbon tetrachloride: 1 cc. (15 minims).

AVERAGE DOSE OF CARBON TETRACHLORIDE—Metric, 1 cc.—
Apothecaries, 15 minims.

CAPSULÆ DIGITALIS

Digitalis Capsules

Cap. Digit.

Digitalis Capsules contain an amount of powdered digitalis corresponding to not less than 95 per cent and not more than 105 per cent of the labeled amount of powdered digitalis (see page 2).

Assay—*Capsules of dry powdered digitalis*—Empty the contents of a sufficient number, not less than 20, of the capsules into a hard glass, glass-stoppered container of at least 50-cc. capacity. Add menstruum consisting of 4 parts of alcohol, by volume, and 1 part of distilled water, by volume, so that the total volume of menstruum corresponds to 1 cc. for each expected U. S. P. Digitalis Unit. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 ± 2 hours at $25^{\circ} \text{C.} \pm 5^{\circ}$ by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter transfer to a centrifuge tube, centrifuge the mixture, and decant into a dry, hard glass bottle having a tight closure. Preserve under refrigeration until used. Do not use for assay after a period of more than 30 days. Assay as directed under *Tinctura Digitalis*, page 510.

Capsules of Digitalis suspended in water-immiscible media (oil, fat, wax, etc.)—Cut a sufficient number, not less than 20, of the capsules, into halves in a dry, shallow glass container. Transfer the contents, together with the capsules, quantitatively, with the aid of a sufficient amount of purified benzin to a dry, hard glass, glass-stoppered container of suitable capacity. Add sufficient purified benzin to make a volume approximately 3 times the volume occupied by the capsule fragments and the contents of the capsules. Shake vigorously and centrifuge. Decant and discard the purified benzin extract. Repeat the purified benzin extraction twice. Place the extraction container with its contents, with the stopper removed, in an oven at 60°C. for 8 hours. Remove it from the oven, allow it to cool, and add 1 cc. of alcohol for each expected U. S. P. Digitalis Unit. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 ± 2 hours at $25^{\circ} \text{C.} \pm 5^{\circ}$ by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter transfer to a centrifuge tube, centrifuge the mixture, and decant into a dry, hard glass bottle having a tight closure. Preserve under refrigeration until used. Do not use for assay after a period of more than 30 days. Assay as directed under *Tinctura Digitalis*, page 510.

Storage—Preserve Digitalis Capsules in well-closed containers.

Sizes—Digitalis Capsules usually available contain the following amounts of digitalis: 50 and 100 mg. ($\frac{3}{4}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF DIGITALIS—Metric, 0.1 Gm.—Apothecaries,
 $1\frac{1}{2}$ grains.

CAPSULÆ DIPHENYLHYDANTOINI SODICI

Diphenylhydantoin Sodium Capsules

Cap. Diphenylhydant. Sod.

Diphenylhydantoin Sodium Capsules contain not less than 93 per cent and not more than 107 per cent of the labeled amount of diphenylhydantoin sodium ($\text{C}_{15}\text{H}_{11}\text{N}_2\text{O}_2\text{Na}$), including all tolerances (see page 2).

Identification—

A: Ignite the contents of 1 or 2 Diphenylhydantoin Sodium Capsules: the residue effervesces with acids and responds to the flame test for sodium, page 592.

B: The diphenylhydantoin obtained in the assay melts between 292° and 299°C. with some decomposition, the bath being preheated to 270°C. , page 595.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 Diphenylhydantoin Sodium Capsules to a beaker. Place the emptied capsules in another beaker, add sufficient alcohol to cover them completely, and allow to stand for 30 minutes with frequent stirring. Filter into the beaker contain-

ing the contents of the capsules, and wash the capsules and filter well with alcohol. Evaporate the liquid nearly to dryness on a steam bath, and dissolve the residue in 45 cc. of distilled water and 5 cc. of sodium hydroxide T.S. Transfer the solution to a 200-cc. volumetric flask, dilute with distilled water to the 200-cc. mark, mix well, and if not clear, filter through a dry filter into a dry flask. Transfer an accurately measured aliquot of the solution, equivalent to about 0.3 Gm. of diphenylhydantoin sodium, to a separator, add distilled water to make about 50 cc., then add 10 cc. of diluted hydrochloric acid. Shake out the precipitated diphenylhydantoin with 100 cc. of absolute ether, then with four successive portions of 25 cc. each of absolute ether. Evaporate the combined ether extracts, and dry to constant weight at 100° C. The weight of the residue of diphenylhydantoin so obtained, multiplied by 1.087, represents the weight of diphenylhydantoin sodium in the aliquot portion taken for the assay.

Storage—Preserve Diphenylhydantoin Sodium Capsules in well-closed containers.

Sizes—Diphenylhydantoin Sodium Capsules usually available contain the following amounts of diphenylhydantoin sodium: 30 and 100 mg. ($\frac{1}{2}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF DIPHENYLHYDANTOIN SODIUM—Metric,
0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

CAPSULÆ FERRI ET AMMONII CITRATUM

Iron and Ammonium Citrates Capsules

Cap. Ferr. et Ammon. Cit.

Iron and Ammonium Citrates Capsules contain an amount of iron (Fe) corresponding to not less than 15.5 per cent and not more than 19.5 per cent of the labeled amount of iron and ammonium citrates, including all tolerances (see page 2).

Identification—The contents of Iron and Ammonium Citrates Capsules respond to *identification tests B, C, D, and E* and to the test for *reaction under Ferri et Ammonii Citrates*, page 184.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 Iron and Ammonium Citrates Capsules to a 250-cc. volumetric flask. Place the emptied capsules in a beaker, and add sufficient cold, distilled water to cover them. Allow to stand for 15 minutes with frequent agitation. Filter into the volumetric flask, and wash the beaker and the filter with small portions of cold distilled water, receiving the washings in the same flask. Add distilled water to the 250-cc. mark, and mix well. Transfer an accurately measured aliquot of the solution, equivalent to about 1 Gm. of iron and ammonium citrates, to a beaker, add 5 cc. of hydrochloric acid and 10 cc. of hydrogen peroxide T.S., and evaporate to dryness on a steam bath. Dissolve the residue in 25 cc. of distilled water and 5 cc. of hydrochloric acid, and transfer the solution completely to a glass-stoppered flask with the aid of 25 cc. of distilled water. Add to the solution 4 Gm. of potassium iodide, stopper the flask, and allow to stand for 15 minutes in the dark. Dilute with 50 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. toward the end of the titration. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.005585 Gm. of Fe.

Storage—Preserve Iron and Ammonium Citrates Capsules in well-closed containers.
Sizes—Iron and Ammonium Citrates Capsules usually available contain the following amount of iron and ammonium citrates: 0.5 Gm. ($7\frac{1}{2}$ grains).

AVERAGE DOSE OF IRON AND AMMONIUM CITRATES—Metric,
1 Gm.—Apothecaries, 15 grains.

CAPSULÆ OLEI CHENOPODII

Oil of Chenopodium Capsules

Cap. Ol. Chenopod.—Oil of American Wormseed Capsules

Oil of Chenopodium Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of oil of chenopodium, including all tolerances (see page 2), and the oil from the Capsules contains not less than 65 per cent of ascaridol, $C_{10}H_{16}O_2$.

Assay—Weigh accurately a counted number of not less than 20 Oil of Chenopodium Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, transfer the contents to another tared weighing bottle, and weigh. Remove any of the oil remaining in the emptied capsules by washing first with small portions of alcohol and once with ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible, then weigh the empty capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of oil of chenopodium in the number of capsules taken.

Transfer the weighed oil to a 50-cc. volumetric flask with the aid of a funnel, and wash the weighing bottle and funnel with 90 per cent acetic acid, then add 90 per cent acetic acid to make 50 cc., mix well, and transfer to a burette. Into a glass-stoppered cylinder of about 150 mm. in length and 25 mm. in diameter, measure, from graduated pipettes, 3 cc. of a solution of potassium iodide (prepared by dissolving 8.3 Gm. of potassium iodide in sufficient distilled water to measure 10 cc.), 5 cc. of hydrochloric acid, and 10 cc. of glacial acetic acid. Immerse the tube in a freezing mixture until the temperature is reduced to $-3^{\circ}C$., then add from the burette a volume of the acetic acid solution of the oil, equivalent to about 0.25 Gm. of oil of chenopodium, mixing it with the cooled reagent as rapidly as possible. Stopper the tube, and set it aside in a cold place (not over $10^{\circ}C$.) for 5 minutes. Note the volume drawn from the burette after 2 minutes. Finally, without diluting, titrate the liberated iodine with tenth-normal sodium thiosulfate. Perform a blank determination with the same quantities of the reagents and in the same manner, but dilute the reagents to 25 cc. with distilled water before titrating the liberated iodine, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.00665 Gm. of $C_{10}H_{16}O_2$.

Storage—Preserve Oil of Chenopodium Capsules in a well-closed container, and protect the oil in the capsules from light. Keep the Capsules preferably at a temperature which does not exceed $35^{\circ}C$.

Sizes—Oil of Chenopodium Capsules usually available contain the following amounts of oil of chenopodium: 0.3 and 0.6 cc. (5 and 10 minims).

AVERAGE DOSE OF OIL OF CHENOPODIUM—Metric, 1 cc.—
Apothecaries, 15 minims.

CAPSULÆ OLEI HIPPOGLOSSI

Halibut Liver Oil Capsules

Cap. Ol. Hippoglos.

Halibut Liver Oil Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of halibut liver oil, including all tolerances (see page 2), and the oil from the Capsules contains, in each Gm., not less than 60,000 U. S. P. Units of Vitamin A. Halibut

Liver Oil Capsules shall be labeled to contain either 5000 or 25,000 U. S. P. Units of Vitamin A per Capsule.

Oil content of capsules—Weigh accurately 20 Halibut Liver Oil Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, and transfer the contents to a suitable container. Remove any oil remaining in the emptied capsules by washing with small portions of ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible. Weigh the emptied capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of halibut liver oil in the 20 Capsules.

Description, tests, and assay—The oil obtained from Halibut Liver Oil Capsules conforms in all respects to the specifications under *Oleum Hippoglossi*, page 322.

Storage—Preserve Halibut Liver Oil Capsules in well-closed containers and protect the oil in the Capsules from light.

AVERAGE DAILY PROPHYLACTIC DOSE—One Capsule containing 5000 U. S. P. Vitamin A Units.

NOTE—The dose of the 25,000 Vitamin A-Unit Capsules is to be determined by the physician in accordance with the needs of the patient.

CAPSULÆ OLEOVITAMINÆ A

Oleovitamin A Capsules

Cap. Oleovitam. A

Oleovitamin A Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of oleovitamin A, including all tolerances (see page 2). The oil in Oleovitamin A Capsules conforms to the definition for *Oleovitamin A*, page 310, but may be adjusted in Vitamin A potency. Oleovitamin A Capsules shall be labeled to contain either 5000 or 25,000 U. S. P. Units of Vitamin A per Capsule.

Oil content of capsules—Weigh accurately 20 Oleovitamin A Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, and transfer the contents to a suitable container. Remove any oil remaining in the emptied capsules by washing with small portions of ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible. Weigh the emptied capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of oil in the 20 Capsules.

Description, tests, and assay—The oil contained in Oleovitamin A Capsules conforms in all respects, with the exception of the potency requirements, to the specifications under *Oleovitaminæ A*, page 310. The Vitamin A potency shall be that claimed on the label.

Storage—Preserve Oleovitamin A Capsules in well-closed containers and protect the oil in the Capsules from light.

AVERAGE DAILY PROPHYLACTIC DOSE—One Capsule containing 5000 U. S. P. Vitamin A Units.

NOTE—The dose of the 25,000 Vitamin A-Unit Capsules is to be determined by the physician in accordance with the needs of the patient.

CAPSULÆ OLEOVITAMINÆ A ET D CONCENTRATÆ

Concentrated Oleovitamin A and D Capsules

Cap. Oleovitam. A et D Conc.—Concentrated Vitamin A and D Capsules

Concentrated Oleovitamin A and D Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of concentrated oleovitamin A and D, including all tolerances (see page 2).

The oil in Concentrated Oleovitamin A and D Capsules conforms to the definition for *Oleovitamina A et D Concentrata*, page 312, but may be adjusted in Vitamin A and Vitamin D potency. Concentrated Oleovitamin A and D Capsules shall be labeled to contain 5000 U. S. P. Units of Vitamin A and 1000 U. S. P. Units of Vitamin D per Capsule.

Oil content of capsules—Weigh accurately 20 Oleovitamin A and D Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, and transfer the contents to a suitable container. Remove any oil remaining in the emptied capsules by washing with small portions of ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible. Weigh the emptied capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of oil in the 20 Capsules.

Description, tests, and assay—The oil contained in Concentrated Oleovitamin A and D Capsules conforms in all respects, with the exception of the potency requirements, to the specifications for *Oleovitamina A et D Concentrata*, page 312. The Vitamin A and Vitamin D potency shall be that claimed on the label.

Storage—Preserve Concentrated Oleovitamin A and D Capsules in well-closed containers and protect the oil in the Capsules from light.

AVERAGE DAILY PROPHYLACTIC DOSE—One Capsule.

CAPSULÆ PENTOBARBITALI SODICI

Pentobarbital Sodium Capsules

Cap. Pentobarb. Sod.—Soluble Pentobarbital Capsules

Pentobarbital Sodium Capsules contain not less than 90 per cent and not more than 105 per cent of the labeled amount of pentobarbital sodium ($C_{11}H_{17}N_2O_3Na$), including all tolerances (see page 2).

Identification—

A: Dissolve the contents of a sufficient number of the capsules, equivalent to about 2 Gm. of pentobarbital sodium, in 25 cc. of distilled water, and filter the solution. To 10 cc. of the filtrate add a slight excess of diluted hydrochloric acid: a white precipitate is formed. Collect the precipitate on a filter, wash it with cold distilled water until the washings are free from chloride, and dry at about 80° C. The melting point of the pentobarbital so obtained is between 127° and 130° C., page 595.

B: A 10-cc. portion of the filtrate obtained in the preceding test responds to *identification test C* under *Pentobarbitalum Sodium*, page 349.

C: Ignite the contents of Pentobarbital Sodium Capsules: the residue effervesces with acids, and responds to the tests for sodium, page 592.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 of the Pentobarbital Sodium Capsules to a 200-cc. volumetric flask. Place the emptied capsules in a beaker, add sufficient cold distilled water to cover them, and allow to stand for 10 minutes with frequent agitation. Filter into the volumetric flask, and wash the beaker and filter with small portions of cold distilled water, receiving the washings in the same flask. Add sufficient distilled water to the flask to make exactly 200 cc., and mix well. Filter, if necessary, through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured volume of the filtrate, equivalent to about 0.3 Gm. of pentobarbital sodium, to a separator, and saturate the solution with sodium chloride. Add 2 cc. of hydrochloric acid, and completely extract the pentobarbital with a solvent composed of 2 volumes alcohol, 1 volume of ether, and 7 volumes of chloroform. Wash the combined extracts with 5 cc. of distilled water acidified with a drop of hydrochloric acid, then filter the solvent extract through a pledget of cotton or other suitable filter into a tared beaker, and wash the separator and the filter with several small portions of the solvent. Evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, and dry the residue to constant weight at a temperature not exceeding 100° C. The weight of the pentobarbital so obtained, multiplied by 1.097, represents the weight of pentobarbital sodium in the portion of the Capsules taken for the assay.

Storage—Preserve Pentobarbital Sodium Capsules in well-closed containers.

Sizes—Pentobarbital Sodium Capsules usually available contain the following amounts of pentobarbital sodium: 30 and 100 mg. ($\frac{1}{2}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF PENTOBARBITAL SODIUM—Metric, 0.1 Gm.—
Apothecaries, $1\frac{1}{2}$ grains.

CAPSULÆ TETRACHLOROÆTHYLENI

Tetrachloroethylene Capsules

Cap. Tetrachloroæthylen.

Tetrachloroethylene Capsules contain not less than 94 per cent and not more than 106 per cent of the labeled amount of tetrachloroethylene (C_2Cl_4), including all tolerances (see page 2).

Identification—Shake the tetrachloroethylene obtained in the assay with about 1 Gm. of anhydrous sodium sulfate, and filter through a pledget of dry absorbent cotton into a dry flask. The filtrate has a specific gravity of 1.600 to 1.620 at 25° C., and all of it distils between 116° and 121° C.

Assay—Place in the flask of a toluene moisture apparatus, page 629, having a graduated receiving tube of 20-cc. capacity, a sufficient number of Tetrachloroethylene Capsules to yield about 15 cc. of tetrachloroethylene. Add 25 cc. of glycerin, and heat the flask with a small flame until the lower layer in the receiving tube does not increase. Cool the receiving tube to 25° C., and adjust the meniscus, if necessary, by washing the walls with a spray of about 2 cc. of distilled water. The volume of the lower layer represents the volume of tetrachloroethylene in the number of Capsules taken for the assay.

Storage—Preserve Tetrachloroethylene Capsules preferably at a temperature which does not exceed 35° C.

Sizes—Tetrachloroethylene Capsules usually available contain the following amounts of tetrachloroethylene: 0.2, 1, and 2.5 cc. (3, 15, and 40 minims).

AVERAGE DOSE OF TETRACHLOROETHYLENE—Metric, 1 cc.—
Apothecaries, 15 minims.

CAPSULÆ THEOBROMINÆ ET SODII ACETATIS

Theobromine and Sodium Acetate Capsules

Cap. Theobrom. et Sod. Acet.

Theobromine and Sodium Acetate Capsules contain an amount of theobromine, $C_7H_8N_4O_2$, equivalent to not less than 53 per cent and not more than 67 per cent of the labeled amount of theobromine and sodium acetate, including all tolerances (see page 2).

Identification—

A: The theobromine obtained in the *assay*, responds to *identification test A*, under *Theobromina et Sodii Acetatis*, page 496.

B: The filtrate obtained in the *assay*, responds to the tests for acetate, page 587.

Assay—Transfer as completely as possible the contents of a sufficient counted number of Theobromine and Sodium Acetate Capsules, to yield about 10 Gm. of theobromine and sodium acetate, to a 50-cc. volumetric flask. Place the emptied capsules in a small beaker, add just sufficient ice-cold distilled water to cover them, and allow to stand for 10 minutes. Pour off the liquid into the volumetric flask, and wash the capsules with small quantities of ice-cold distilled water, adding the washings to the flask. Add sodium hydroxide T.S. to the flask until the solution is clear or nearly so, then dilute to 50 cc. with distilled water, and mix well.

Transfer exactly 10 cc. of this solution to a small dish, add 2 drops of phenolphthalein T.S., then add normal hydrochloric acid until the red color is just discharged. The solution should now be slightly alkaline to litmus, but if not, it should be made so by the addition of 1 or 2 drops of very dilute ammonia T.S. Allow the mixture to stand at 20° to 25° C. for 3 hours, stirring occasionally. Completely transfer the precipitate of theobromine to a dry, weighed, small filter, and wash the dish and the precipitate on the filter with four successive portions of 5 cc. each of cold, distilled water. Dry to constant weight at 100° C., and to the weight of the theobromine thus obtained add 15 mg. (the approximate quantity of theobromine remaining in the filtrate).

About 0.2 Gm. of the theobromine obtained in the assay leaves only a negligible residue upon ignition.

Storage—Preserve Theobromine and Sodium Acetate Capsules in well-closed containers.

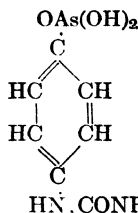
Sizes—Theobromine and Sodium Acetate Capsules usually available contain the following amounts of theobromine and sodium acetate: 0.1 and 0.2 Gm. (1½ and 3 grains).

AVERAGE DOSE OF THEOBROMINE AND SODIUM ACETATE—
Metric, 0.2 Gm.—Apothecaries, 3 grains.

CARBARSONUM

Carbarsone

Carbarson.

 $\text{C}_7\text{H}_9\text{AsN}_2\text{O}_4$

Mol. wt. 260.07

Carbarsone, when dried at 80° C. for 6 hours, contains not less than 28.1 per cent and not more than 28.8 per cent of arsenic (As).

Description—Carbarsone occurs as a white, almost odorless powder, having a slightly acid taste.

Solubility—Carbarsone is slightly soluble in water and in alcohol, and is nearly insoluble in chloroform and in ether. It is soluble in solutions of alkali hydroxides and carbonates.

Melting point—Carbarsone melts between 169° and 172° C., page 595.

Identification—

- A: Place about 0.4 Gm. of Carbarsone in a test tube, add 5 cc. of sodium hydroxide solution (1 in 5), and heat gently: a piece of moistened red litmus paper held over the mouth of the tube turns blue.
- B: Place about 1 Gm. of Carbarsone in a test tube and dissolve it in 10 cc. of sodium hydroxide T.S. and 10 cc. of distilled water, add 2 Gm. of sodium hydrosulfite, and warm the mixture to 50° C.: a light yellow precipitate is formed, which is insoluble in an excess of sodium hydroxide T.S.
- C: To a portion of the solution resulting from the assay add hydrogen sulfide T.S.: a yellow precipitate of arsenic sulfide is produced, which is soluble in ammonium carbonate T.S.

Loss on drying—Dry about 1 Gm. of Carbarsone, accurately weighed, for 6 hours at 80° C.: the loss in weight does not exceed 1.5 per cent.

Reaction—A saturated aqueous solution of Carbarsone is acid to litmus.

Arsenate—Dissolve 0.5 Gm. of Carbarsone in 2 cc. of ammonia T.S., dilute to 5 cc. with distilled water, add 3 cc. of magnesia mixture T.S., and shake vigorously: no precipitate forms within 30 minutes.

Assay—Place about 0.2 Gm. of Carbarsone, previously dried at 80° C. for 6 hours and accurately weighed, in a 200- to 300-cc. glass-stoppered flask, and determine the arsenic content as directed in the assay for *Arsphenamina*, page 71. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003746 Gm. of As.

Storage—Preserve Carbarsone in well-closed containers.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

CARBASUS ABSORBENS

Absorbent Gauze

Carbas. Absorb.—Gauze, Plain Gauze, Non-sterilized Absorbent Gauze

Absorbent Gauze consists of well bleached cotton cloth of plain weave.

Description—Absorbent Gauze is white cotton cloth of various thread counts and weights. The following table gives the commercial designations in type and in terms of thread count and the standard weight in grams per linear yard. It also gives the width of the gauze in inches. A variation of $\pm 1/2$ inch shall be allowed in width.

Type	Threads per 25.4 mm. (1 Inch)		Standard Weight, Gm. per Linear Yard	Width in Inches
	Warp	Filling		
I	44	40	46.8	38.5
II	32	28	31.3	36
III	28	24	27.0	36
IV	24	20	23.2	36
V	22	18	21.5	36
VI	20	16	18.8	36
VII	20	12	17.2	36

All Absorbent Gauze shall be conditioned for at least 4 hours in a standard atmosphere of 65 per cent, ± 2 per cent, relative humidity at 21°C ., $\pm 1.1^{\circ}\text{C}$. (70°F ., $\pm 2^{\circ}\text{F}$.), before making any measurements thereon, and the weight and thread-count shall be determined under these atmospheric conditions. The Absorbent Gauze must be removed from its wrappings before being placed in the conditioning atmosphere, and if in the form of bolts or rolls, the quantity necessary for the various tests shall be cut from the piece, excluding the first two and the last two yards when the total quantity of Gauze available permits of so doing.

Thread count—Determine the number of warp and of filling threads of Absorbent Gauze by counting the actual number of threads in 76.2 mm. (3 inches) of width in each direction at three different places in the cloth, if possible, making the count no nearer any edge than one-tenth the dimension of the fabric and not including the same threads in any two counts. If either dimension of the piece does not exceed 76.2 mm. (3 inches), the entire number of threads shall be counted in that dimension in three different places in the piece.

A variation in the average count of 3 threads to the inch in the warp and 3 threads to the inch in the filling, but not more than 4 threads to the square inch, shall be allowed in 44 x 40 gauze. A variation in the average count of 2 threads to the inch in the warp and 2 threads to the inch in the filling, but not more than 3 threads to the square inch shall be allowed in 32 x 28, 28 x 24, 24 x 20, 22 x 18, 20 x 16, and 20 x 12 gauze.

A variation of ± 8 per cent in the standard weight is allowed when the length of the gauze, the piece being of full width, is more than 1 yard, and a variation of ± 12 per cent when the piece is less than this quantity in either dimension.

Weight—Determine the weight of Absorbent Gauze by weighing a piece exactly 91.4 cm. long, including the entire width of the piece, or if the dimensions are less than 91.4 cm. by 91.4 cm., weigh the entire piece and calculate the weight of exactly 0.836 square meter (1 linear yard). In the case of Type I Gauze, calculate the weight of exactly 0.894 square meter (1 linear yard).

Ash—Place about 5 Gm. of Absorbent Gauze, accurately weighed, in a porcelain or platinum dish, and moisten with diluted sulfuric acid. Gently heat the mixture until it is charred, then ignite more strongly until the carbon is completely consumed: the yield of ash is not more than 0.15 per cent of the weight of the Gauze.

Absorbency—Fold about 90 cm. (about 1 yard) of Absorbent Gauze into a 10 cm. (4 inch) square, and lightly join the loose ends with a No. 30 to No. 60 white cotton thread. Hold the folded gauze almost in contact with the surface of distilled water at 25°C ., and allow it to drop lightly upon the water: not more than 30 seconds are required for complete submersion.

Water extract—Place 20 Gm., ± 0.1 Gm., of Absorbent Gauze in 500 cc. of distilled water, and boil the mixture for 15 minutes, adding boiling distilled water as necessary to maintain the original volume. Pour the water through a funnel into a 1000-cc. volumetric flask, transfer the Absorbent Gauze to the funnel, press out the excess water with a glass rod, and wash it with two successive 250-cc. portions of boiling distilled water, pressing the gauze after each washing. Combine the washings and make the total volume measure 1000 cc. Evaporate 400 cc. of the solu-

tion in a suitable dish on a water bath, and dry the residue to constant weight at 105° C.: the weight of the residue, multiplied by 2.5, is not more than 0.25 per cent of the weight of the Gauze. Ignite the residue to constant weight in a muffle furnace at a dull-red heat: the weight of the ash of the water extract, multiplied by 2.5, is not more than 0.075 per cent of the weight of the Gauze.

Acid or alkali—Divide the remaining 600 cc. of the water extract into three equal portions. Add to one portion 3 drops of phenolphthalein T.S. and to another portion 1 drop of methyl orange T.S.: no pink color develops in either portion.

Dextrin or starch—To the third portion of the water extract, add 1 drop of iodine T.S.: no red, violet, or blue color develops.

Fatty matter—Pack 10 Gm., ± 10 mg., of Absorbent Gauze in a Soxhlet extractor, and extract with ether, adjusting the temperature so that the ether will siphon over not less than four times per hour in the tared flask of the extraction apparatus, and continue the extraction for 5 hours. The ether solution in the flask shows no trace of blue, green or brownish color. Evaporate the extract to dryness, and dry to constant weight at 105° C.: the weight of the residue does not exceed 70 mg.

Dyes—Pack 10 Gm. of Absorbent Gauze in a narrow percolator, and extract slowly with alcohol until the percolate measures 50 cc.: when observed downward in a column 20 cm. in depth, the percolate may show a yellowish color, but neither a blue nor a green tint.

Storage—Preserve Absorbent Gauze in a well-closed container. The type, thread count, length, and width of the Gauze must be stated on the container, and the designation “*unsterilized*” or “*not sterilized*” must appear prominently thereon.

CARBASUS ABSORBENS ADHÆSIVUS

Adhesive Absorbent Gauze

Carbas. Absorb. Adhæs.—Adhesive Absorbent Compress

Description—Adhesive Absorbent Gauze is an individual dressing prepared by affixing a plain absorbent compress to a strip of adhesive plaster. The compress shall be composed of at least four layers of Type I absorbent gauze or an equivalent weight of any other Type or combination of Types of absorbent gauze, or shall be of other absorbent cellulosic material covered with a layer of absorbent gauze. The absorbent gauze shall be substantially free from loose threads or ravelings. The adhesive plaster may be perforated over the compress, and the back may be coated with a water-repellent film.

The adhesive surface must be protected by strips of crinoline or other protective material of not less than the same width as the dressing and which overlap to protect each absorbent compress.

Adhesive Absorbent Gauze must be sterile and be protected from contamination by suitable packaging.

Sterility—Adhesive Absorbent Gauze meets the requirements of the *Sterility Tests for Solids*, page 610.

Storage—Adhesive Absorbent Gauze must be packaged individually in such manner that the sterility is maintained until the individual package is opened for use, and the individual packages must be grouped in a second protective container. Adhesive Absorbent Gauze shall be sterilized in the individual packages. The container shall bear a statement to the effect that the sterility of the Adhesive Absorbent Gauze cannot be guaranteed if the individual package bears evidence of damage or has been previously opened.

Preserve Adhesive Absorbent Gauze preferably at a temperature which does not exceed 30° C. and do not expose to sunlight.

CARBASUS ABSORBENS STERILIS

Sterile Absorbent Gauze

Carbas. Absorb. Steril.—Sterile Gauze

Sterile Absorbent Gauze is absorbent gauze which has been rendered sterile and protected from contamination. Sterile Absorbent Gauze may be supplied in various lengths and widths, and in the form of rolls or folds.

Description—Sterile Absorbent Gauze complies with the definition, description, and tests under *Carbasus Absorbens*, page 114.

Dimensions—The dimensions of Sterile Absorbent Gauze shall be not less than 98 per cent of the labeled dimensions of the Gauze.

Sterility—Sterile Absorbent Gauze meets the requirements of the *Sterility Tests for Solids*, page 610.

Storage—Each Sterile Absorbent Gauze unit shall be so packaged individually, that the sterility of the unit is maintained until the package is opened for use. Sterile Absorbent Gauze shall be sterilized in the package, and the package shall bear a statement to the effect that the sterility of the Gauze cannot be guaranteed if the package bears evidence of damage or has been previously opened. The length, width, and type of the gauze shall be stated upon the package.

CARBO ACTIVATUS

Activated Charcoal

Carbo Activat.

Activated Charcoal is the residue from the destructive distillation of various organic materials, treated to increase its adsorptive power.

Note—When “*Carbo Ligni*” is prescribed, “*Carbo Activatus*” may be dispensed.

Description—Activated Charcoal is a fine, black, odorless, tasteless powder free from gritty matter.

Volatile substances—Dry Activated charcoal to constant weight at 120° C.: the loss does not exceed 15 per cent.

Ash—Ignite about 0.5 Gm. of Activated Charcoal, accurately weighed, to constant weight in a platinum crucible: the residue does not exceed 4 per cent.

Reaction—Boil 3 Gm. of Activated Charcoal with 60 cc. of distilled water for 5 minutes, allow to cool, dilute to the original volume with distilled water, and filter: the filtrate is colorless and is neutral to litmus paper.

Chloride—A 10-cc. portion of the filtrate obtained in the test for reaction shows no more *chloride* than is equivalent to 1.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Another 10-cc. portion of the filtrate obtained in the test for reaction shows no more *sulfate* than is equivalent to 1 cc. of fiftieth-normal sulfuric acid, page 626.

Sulfide—Boil 0.5 Gm. of Activated Charcoal with a mixture of 20 cc. of distilled water and 5 cc. of hydrochloric acid: lead acetate test paper is not blackened when held in the vapor of the boiling mixture.

Cyanogen compounds—Place a mixture of 5 Gm. of Activated Charcoal, 50 cc. of distilled water, and 2 Gm. of tartaric acid in a distilling flask connected with a condenser provided with a tightly fitting adapter, the end of which dips under the surface of a mixture of 2 cc. of sodium hydroxide T.S. and 10 cc. of distilled water, contained in a small flask surrounded by ice. Heat the mixture in the distilling

flask to boiling, and distil about 25 cc. Dilute the distillate to 50 cc. with distilled water, and mix thoroughly. To 25 cc. of the diluted distillate add about 50 mg. of ferrous sulfate dissolved in 1 cc. of distilled water, heat the mixture almost to boiling, cool, and add 1 cc. of hydrochloric acid: no blue color is produced.

Acid-soluble substances—Boil 1 Gm. of Activated Charcoal with a mixture of 20 cc. of distilled water and 5 cc. of hydrochloric acid for 5 minutes, filter into a tared porcelain crucible, and wash the residue with 10 cc. of hot distilled water, adding the washings to the filtrate. Add 1 cc. of sulfuric acid to the filtrate, evaporate to dryness, and ignite the residue to constant weight at a dull red heat: the weight of the residue does not exceed 35 mg.

Heavy metals—Boil 1 Gm. of Activated Charcoal with a mixture of 20 cc. of diluted hydrochloric acid and 5 cc. of bromine T.S. for 5 minutes, filter, and wash the charcoal and filter with 50 cc. of boiling distilled water. Evaporate the filtrate and washings to dryness, and extract the residue with a mixture of 1 cc. of normal hydrochloric acid, 20 cc. of distilled water, and 5 cc. of sulfurous acid T.S. Boil the solution until all of the sulfur dioxide is expelled, then dilute it to a volume of 50 cc. with distilled water. To 10 cc. of the solution add 10 cc. of hydrogen sulfide T.S.: the solution does not show a darker coloration in 10 seconds than that produced by the addition of 10 cc. of hydrogen sulfide T.S. to 10 cc. of distilled water, to which 0.1 cc. of standard lead solution, page 586, has been added.

Uncarbonized constituents—To 0.25 Gm. of Activated Charcoal add 10 cc. of sodium hydroxide T.S., heat to boiling, and filter: the filtrate is colorless.

Adsorptive power—

A: Dissolve 0.1 Gm. of strychnine sulfate in 50 cc. of distilled water, add 1 Gm. of Activated Charcoal, shake the mixture vigorously for 5 minutes, filter immediately through a dry filter, and reject the first 20 cc. of filtrate. The addition of 1 drop of hydrochloric acid and 5 drops of mercuric potassium iodide T.S. to a 10-cc. portion of the subsequent filtrate produces no turbidity.

B: Dissolve 0.25 Gm. of methylthionine chloride in enough distilled water to make 250 cc. of solution. Measure exactly 50 cc. of this solution at 25° C., into each of two 100-cc. glass-stoppered flasks. Add to one flask exactly 0.25 Gm. of Activated Charcoal, stopper the flask, and shake it vigorously for 5 minutes. Filter the contents of each flask through a filter, which has not been previously moistened, rejecting the first 20 cc. of each filtrate. Measure exactly 25 cc. of the remaining filtrate into each of two 250-cc. volumetric flasks. Add to each flask 50 cc. of an aqueous solution of sodium acetate (1 in 10), and mix thoroughly, then add from a burette 35 cc. of tenth-normal iodine, keeping the mixture in constant rotation. Stopper the flasks and allow them to stand for 50 minutes, shaking them vigorously at intervals of 10 minutes. Dilute each mixture to exactly 250 cc. with distilled water, mix thoroughly, allow to stand for 10 minutes, and filter each through a filter, which has not been previously moistened, rejecting the first 30 cc. of each filtrate. Determine the excess of iodine in 100 cc. of each filtrate by titration with tenth-normal sodium thiosulfate. Calculate the number of cubic centimeters of tenth-normal iodine consumed in each titration: the difference between the two titrations is not less than 0.7 cc.

Storage—Preserve Activated Charcoal in well-closed containers.

CARBONEI DIOXIDUM

Carbon Dioxide

Carbon. Dioxid.—Carbonic Acid Gas

CO₂

Mol. wt. 44.01

Carbon Dioxide contains not less than 99 per cent by volume of CO₂.

Description—Carbon Dioxide is an odorless, colorless gas. An aqueous solution of the gas has a faintly acid taste. A liter of Carbon Dioxide at a pressure of 760 mm. and at 0° C. weighs 1.977 Gm.

Solubility—One volume of Carbon Dioxide dissolves in about 1 volume of water at 25° C.

Identification—

A: Carbon Dioxide extinguishes a flame.

B: Carbon Dioxide produces a white precipitate when passed into barium hydroxide T.S., the precipitate dissolving in acetic acid with effervescence.

Note—Cylinders containing Carbon Dioxide must be kept at a temperature between 20° and 30° C. for at least 6 hours before samples are withdrawn for the following determinations. Samples for the following tests and assay are to be measured at room temperature and corrected to a pressure of 760 mm. and a temperature of 25° C.

Acid and sulfur dioxide—Pass 1000 cc. of Carbon Dioxide through 50 cc. of recently boiled distilled water which has been cooled to room temperature. Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of the gas. The delivery tube must have an orifice approximately 1 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the distilled water. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with 50 cc. of distilled water. After the passage of the gas, pour the liquid into one of two similar comparator tubes "A" and add 0.1 cc. of methyl orange T.S. To the other tube "B" containing 50 cc. of cooled, recently boiled distilled water, add 1 cc. of hundredth-normal hydrochloric acid, and then 0.1 cc. of methyl orange T.S. Viewed downward over a white surface, the liquid in tube "A" shows no deeper shade of red than that in tube "B."

Phosphine, hydrogen sulfide, and organic reducing substances—Pass 1000 cc. of Carbon Dioxide, under conditions comparable to those in the test for *acid and sulfur dioxide*, through a mixture of 25 cc. of silver ammonium nitrate T.S. and 3 cc. of ammonia T.S.: no turbidity or darkening is produced, as shown by comparing it with another portion of the test solution through which the gas has not been passed.

Carbon monoxide—Collect 1000 cc. of the Carbon Dioxide to be tested, and, for a blank test, 1000 cc. of carbon dioxide which is carbon monoxide-free, page 561, in suitable flasks. Add 10 cc. of distilled water to 0.5 cc. of blood, page 660, and mix thoroughly. Immediately add 2.5 cc. of the blood dilution to each flask, stopper, and shake the flasks frequently during 15 minutes. To each flask add 40 mg. of a mixture of equal parts by weight of pyrogallol and tannic acid. Shake thoroughly, and allow the flasks to stand in the dark for 15 minutes. Pour the contents of each flask into test tubes for observation. The solution from the Carbon Dioxide being tested shows no pink coloration and matches the gray color produced in the blank test.

Assay—Place a sufficient quantity of mercury in a 100-cc. gas burette or nitrometer, provided with a two-way stopcock and a two-way outlet, and properly connected with a balancing tube. Connect one of the outlet tubes of the nitrometer with a gas pipette of suitable capacity. Place in the pipette about 125 cc. of 50 per cent potassium hydroxide solution. Draw the liquid (free from air bubbles) through the capillary opening, connection, and stopcock opening in the nitrometer by reducing the pressure in the nitrometer tube and opening the stopcock controlling the connection with the gas pipette. Then close the stopcock. Having completely filled the nitrometer, the other stopcock opening, and the other intake tube with mercury, draw into the nitrometer exactly 100 cc. of Carbon Dioxide by reducing the pressure in the tube. Close this stopcock. Increase the pressure on the Carbon Dioxide in the nitrometer tube, and open the stopcock controlling the connection with the gas pipette. Force the entire volume of gas into the pipette. Close the stopcock, and rock the pipette gently, providing frequent contact of the liquid and the gas. At the end of 5 minutes most of the gas will have been absorbed by the liquid. At this time, to facilitate the absorption of the last portion of the Carbon Dioxide, draw some of the liquid into the nitrometer tube, and force the residual gas back upon the surface of the liquid in the gas pipette. Again rock the pipette until no further diminution in the volume of gas

occurs. Draw the residual gas, if any, into the nitrometer tube, and measure its volume. Not more than 1 cc. of gas remains.

Storage—Preserve Carbon Dioxide in tight containers.

CARBONEI TETRACHLORIDUM

Carbon Tetrachloride

Carbon. Tetrachlorid.

CCl_4

Mol. wt. 153.84

Description—Carbon Tetrachloride is a clear, colorless, mobile liquid. It has a characteristic, ethereal odor, resembling that of chloroform. Carbon Tetrachloride is not inflammable, but is slowly decomposed by light and by various metals if moisture is present.

Solubility—Carbon Tetrachloride dissolves in about 2000 times its volume of water, and is miscible with alcohol, with chloroform, and with ether. It dissolves most of the fixed and volatile oils.

Specific gravity—The specific gravity of carbon tetrachloride is not less than 1.588 and not more than 1.590 at 25° C.

Distillation range—Carbon Tetrachloride distills between 76° and 78° C.

Non-volatile residue—Evaporate 50 cc. of Carbon Tetrachloride in a tared porcelain dish on a water bath to a volume of about 1 cc., and allow it to evaporate spontaneously to dryness: the residue, if any, is odorless. Dry the residue at 100° C. for 1 hour and weigh: the weight of the residue does not exceed 1 mg.

Carbonizable substances—Measure 40 cc. of Carbon Tetrachloride into a glass-stoppered separator previously rinsed with sulfuric acid. Add 5 cc. of sulfuric acid, shake the mixture vigorously for 5 minutes, allow it to separate completely, and transfer the sulfuric acid layer to a comparison vessel: it has no more color than matching fluid A, page 563.

Acid, chloride ion, and free chlorine—Shake 15 cc. of Carbon Tetrachloride with 25 cc. of recently boiled and cooled distilled water during 5 minutes, and allow the liquids to separate completely: the aqueous layer is neutral to litmus paper, and separate, 10-cc. portions are not affected by a few drops of silver nitrate T.S., or colored blue by the addition of a few drops each of potassium iodide T.S. and starch T.S.

Carbon disulfide—Mix 10 cc. of Carbon Tetrachloride with an equal volume of a 10 per cent solution of potassium hydroxide in alcohol, and allow the mixture to stand for 1 hour. Add 5 cc. of acetic acid, and follow this with 1 cc. of cupric sulfate T.S.: no yellow precipitate appears in the mixture within 2 hours.

Storage—Preserve Carbon Tetrachloride in tight, light resistant containers.

U. S. P. Product of Carbon Tetrachloride—Capsulæ Carbonei Tetrachloridi.

AVERAGE DOSE—*Caution!* As an anthelmintic for adults.
single dose, Metric, 1 cc.—Apothecaries, 15 minims.

CARDAMOMI SEMEN

Cardamom Seed

Cardam. Sem.

Cardamom Seed is the dried ripe seed of *Elettaria Cardamomum* Maton (Fam. *Zingiberaceæ*).

Cardamom Seed should be recently removed from the capsules.

Cardamom Seed yields not more than 4 per cent of acid-insoluble ash, page 629.

Description—Mostly agglutinated into groups of 2 to 7 by the adhering membranous aril, the individual seeds oblong-ovoid or irregularly 3- to 4-sided, from 3 to 4 mm. in length; convex on the dorsal side, strongly longitudinally grooved on the ventral side and coarsely tuberculated; externally pale orange to dark brown; odor aromatic; taste aromatic, pungent and slightly bitter.

Histology—A loosely attached membranous arillus; seed-coat consisting of an epidermal layer of thick-walled cells, a pigment layer of small cells with red to orange contents, a layer of volatile oil cells with suberized walls and a single layer of radially elongated strongly lignified stone cells with inner walls heavily thickened, and a minute lumen containing silica. Perisperm large, colorless, surrounding a central, orange to yellow endosperm enclosing a small straight embryo.

Powdered Cardamom Seed—Pale brown to weak yellow to light olive green; endosperm and perisperm cells filled with starch grains from 1 to 4 microns in diameter or containing one or more prisms of calcium oxalate from 10 to 25 microns in diameter; fragments of seed-coat with red to orange colored cells, polygonal in surface view and about 20 microns in diameter; fragments of pericarp tissue with spiral tracheæ and with accompanying slightly lignified fibers, relatively few.

Storage—Preserve Cardamom Seed against attack by insects, page 5.

U. S. P. Product of Cardamom Seed—Tinctura Cardamomi Composita.

CARUM

Caraway

Caraway Fruit, Caraway Seed

Caraway is the dried ripe fruit of *Carum Carvi* Linné (Fam. *Umbelliferae*).

Caraway contains not more than 3 per cent of other fruits, seeds, or foreign organic matter, and yields not more than 1.5 per cent of acid-insoluble ash, page 629.

Description—

Unground Caraway—Usually in separated mericarps; curved, tapering toward both ends; up to about 7 mm. in length and 2 mm. in diameter; externally dark brown to weak brown with 5 lighter colored, filiform, primary ribs between each pair of which, on the dorsal surface, occurs a secondary rib; odor and taste aromatic.

Histology—Mericarps nearly equilaterally pentangular with a fibrovascular bundle in each primary rib; epicarp of tangentially elongated epidermal cells with thick outer walls possessing a striated cuticle; mesocarp of collapsed, thin-walled parenchyma normally bearing 4 dorsal vittæ and 2 commissural vittæ, sometimes one or more additional, and located between the primary rib regions; endocarp of broad, slightly undulate, inner epidermal cross cells which are coherent with the collapsed cells of the spermoderm; endosperm of thick-walled, reserve parenchyma containing fixed oil and aleurone grains up to 10 microns in diameter, the latter with embedded rosette aggregates of calcium oxalate up to 4 microns in diameter; an embryo embedded in the upper end of the endosperm.

Powdered Caraway—Moderate yellowish brown to light olive brown; fragments of the epicarp with striped cuticle; numerous polyhedral endosperm cells containing aleurone grains with embedded rosette aggregate crystals of calcium oxalate; few fragments of slightly lignified fibers and spiral tracheæ; fragments of cross cells of endocarp; orange to yellow fragments of vittæ; no reticulate parenchyma.

Storage—Preserve Caraway in well-closed containers. Caraway is susceptible to attack by insects, page 5.

CARYOPHYLLUS

Clove

Caryoph.—Cloves

Clove is the dried flower-bud of *Eugenia caryophyllata* Thunberg (Fam. *Myrtaceæ*).

Clove yields, from each 100 Gm., not less than 16 cc. of oil of clove. It contains not more than 5 per cent of its stems and not more than 1 per cent of other foreign matter, and yields not more than 10 per cent of crude fiber, page 630, and not more than 0.75 per cent of acid-insoluble ash, page 629.

Description—

Unground Clove—From 10 to 17.5 mm. in length, of a dark brown, or dusky red color, consisting of a sub-cylindrical, slightly flattened, four-sided hypanthium which contains in its upper portion a 2-celled, inferior ovary with numerous ovules attached to a central placenta, the hypanthium terminated by 4 thick, divergent sepals and surmounted by a nearly globular head, consisting of 4 membranous, imbricated petals, which enclose numerous curved stamens and 1 style; odor strongly aromatic; taste pungent and aromatic, followed by a slight numbness of the tongue.

Stems sub-cylindrical or 4-angled, attaining a length of 25 mm. and a diameter of 4 mm., either simple, branching, or distinctly jointed, and less aromatic than the flower buds.

Powdered Clove—Dark brown; parenchyma fragments showing the large oval schizolysigenous oil reservoirs, spiral tracheae and a few rather thick-walled, spindle-shaped fibers; calcium oxalate in rosette aggregates, from 10 to 15 microns in diameter; fragments of the walls of anthers with characteristic reticulated cells; pollen grains numerous, tetrahedral, from 15 to 20 microns in diameter.

Purity—Stone cells, irregular or polygonal, up to about 70 microns in diameter, with thick, porous walls and large lumina, sometimes filled with an orange or yellow amorphous substance, are few or absent (less than 5 per cent of clove stems).

Clove fruit or cereals—Starch grains are absent.

Assay—Proceed as directed for the *Volatile Oil Determination*, page 632.

Storage—Preserve Clove in well-closed containers and avoid exposure to excessive heat.

U. S. P. Product of Clove—Oleum Caryophylli.

CASCARA SAGRADA

Cascara Sagrada

Casc. Sagr.—*Rhamnus Purshiana*

Cascara Sagrada is the dried bark of *Rhamnus Purshiana* De Candolle (Fam. *Rhamnaceæ*).

Cascara Sagrada should be collected at least one year before being used in medicinal preparations. It contains not more than 4 per cent of foreign organic matter, page 628.

Description—

Unground Cascara Sagrada—Usually in flattened or transversely curved pieces, occasionally in quills; bark from 1 to 5 mm. in thickness; outer surface brown, purplish brown or brownish red, longitudinally ridged, with grayish or whitish lichen patches, sometimes with numerous lenticels and occasionally with moss attached; inner surface longitudinally striate, light yellow, weak reddish brown or moderate yellowish brown; fracture short with projections of bast fiber bundles in the inner bark; odor distinct; taste bitter and slightly acrid.

Histology—Cork yellowish brown, purple or reddish brown, up to 10 or more rows of small cells; stone cells in yellowish, tangentially elongated groups of 20 to 50 cells; medullary rays 1 to 4 cells wide, 15 to 25 cells deep, frequently diagonal or curved, forming converging groups; bast fibers in small bundles, more or less surrounded by crystal fibers and located between the medullary rays; parenchyma with brown walls and containing starch grains or calcium oxalate.

Powdered Cascara Sagrada—Moderate yellowish brown to dusky yellowish orange; consisting of broken bast fiber bundles with the accompanying crystal fibers containing monoclinic prisms of calcium oxalate; stone cells more or less adhering, with thick, finely lamellated and porous walls; fragments of reddish brown to yellow cork; masses of parenchyma and medullary ray cells colored reddish brown to orange upon the addition of a solution of an alkali; starch grains spheroidal, up to 8 microns in diameter; calcium oxalate in monoclinic prisms or rosette aggregates from 6 to 20 microns in diameter, occasionally up to 45 microns in diameter.

Identification—

- A: Add 0.1 Gm. of powdered Cascara Sagrada to 10 cc. of hot water, shake the mixture occasionally until it is cold, then filter it, dilute the filtrate with sufficient water to make it measure 10 cc., and add 10 cc. of ammonia T.S.: an orange color is produced in the mixture.
- B: Cascara gives a red to reddish brown color when treated with ammonia T.S.
- C: Macerate 0.1 Gm. of powdered Cascara Sagrada with 10 drops of alcohol, add 10 cc. of water, boil the mixture, then cool and filter it, and shake the filtrate with 10 cc. of ether: a greenish yellow ether solution separates. Shake 3 cc. of this ether solution with 3 cc. of ammonia T.S., and dilute the separated ammonia solution with 20 cc. of water: the mixture retains a distinct orange pink color.

U. S. P. Products of Cascara Sagrada—*Extractum Cascaræ Sagradæ*, *Fluidextractum Cascaræ Sagradæ*, *Fluidextractum Cascaræ Sagradæ Aromaticum*, *Tabellæ Cascaræ Sagradæ*.

CERA ALBA

White Wax

Cera Alb.—Bleached Beeswax

White Wax is bleached yellow wax.

Description—White Wax is a yellowish white solid, somewhat translucent in thin layers. It has a faint, characteristic odor, is free from rancidity, and is nearly tasteless.

Acid value—The acid value of White Wax is not less than 17 and not more than 24, when determined as directed under *Cera Flava*, page 578.

Ester value—The ester value of White Wax is not less than 72 and not more than 79, when determined as directed under *Cera Flava*, page 578.

Other characteristics—In other respects White Wax has the characteristics of *Cera Flava*, page 124.

Storage—Preserve White Wax in well-closed containers.

CERA FLAVA

Yellow Wax

Cera Flav.—Beeswax

Yellow Wax is the purified wax from the honeycomb of the bee, *Apis mellifera* Linné (Fam. *Apidae*).

Description—Yellow Wax is a solid, varying in color from yellow to grayish brown. It has an agreeable, honey-like odor, and a faint, characteristic taste. It is somewhat brittle when cold, and presents a dull, granular, non-crystalline fracture when broken. It becomes plastic from the heat of the hand.

Solubility—Yellow Wax is insoluble in water, and sparingly soluble in cold alcohol. Boiling alcohol dissolves the cerotic acid and a portion of the myricin, which are constituents of Yellow Wax. It is completely soluble in chloroform, in ether, and in fixed and volatile oils; partly soluble in cold benzene and in carbon disulfide, and completely soluble in these liquids at about 30° C.

Specific gravity—The specific gravity of Yellow Wax is about 0.9 at 25°.

Melting point—Yellow Wax melts between 62° and 65° C., page 595.

Carnauba wax—Place 0.1 Gm. of Yellow Wax in a test tube and add 20 cc. of *n*-butanol. Immerse the test tube in boiling water, and shake the mixture gently until solution is complete. Immerse the test tube in a beaker of water at 60° C., and allow it to cool to room temperature during a period of 2 hours. A loose mass of fine, needle-like crystals separates from a clear mother-liquor. Under the microscope the crystals should appear as loose needles or stellate clusters, without the presence of amorphous masses, the latter indicating the presence of carnauba wax.

Fats or fatty acids, Japan wax, rosin, or soap—Boil 1 Gm. of Yellow Wax for 30 minutes with 35 cc. of an aqueous solution of sodium hydroxide (1 in 7), the volume being preserved by the occasional addition of distilled water, and cool the mixture: the wax separates without rendering the liquid opaque. Filter the cold mixture through glass wool or asbestos, and add to the filtrate an excess of hydrochloric acid: no precipitate is observed.

Acid value—Warm about 3 Gm. of Yellow Wax, accurately weighed, in a 200-cc. flask with 25 cc. of neutral dehydrated alcohol until melted, add 1 cc. of phenolphthalein T.S., and titrate the warm liquid with half-normal alcoholic potassium hydroxide to produce a permanent, faint pink color: the acid value so obtained is not less than 18 and not more than 24, page 578.

Ester value—To the solution resulting from the determination of *acid value* add 25 cc. of half-normal alcoholic potassium hydroxide and 50 cc. of alcohol, boil the mixture for 4 hours under a reflux condenser, and titrate the excess of the alkali with half-normal hydrochloric acid: the ester value so obtained is not less than 72 and not more than 77, page 578.

Storage—Preserve Yellow Wax in well-closed containers.

CERATUM

Cerate

Cerat.—Simple Cerate

WHITE WAX.....	300 Gm.
BENZOINATED LARD.....	700 Gm.
To make.....	<u>1000 Gm.</u>

Melt the white wax on a water bath, add the benzoinated lard, and heat until it is liquefied. Strain the liquid, if necessary, and stir it constantly until it congeals.

Storage—Preserve Cerate in well-closed containers, preferably at a temperature which does not exceed 35° C.

CERATUM RESINÆ

Rosin Cerate

Cerat. Res.—Resin Cerate

ROSIN.....	350 Gm.
YELLOW WAX.....	150 Gm.
LARD.....	500 Gm.
To make.....	<u>1000 Gm.</u>

Melt the rosin, add the yellow wax and lard, and heat the mixture until it is liquefied, then strain the liquid through muslin, and stir it occasionally until it congeals.

Storage—Preserve Rosin Cerate in well-closed containers.

CETACEUM

Spermaceti

Cetac.

Spermaceti is a waxy substance obtained from the head of the sperm whale, *Physeter macrocephalus* Linné (Fam. *Physeteridæ*).

Description—Spermaceti occurs in white, somewhat translucent, slightly unctuous masses, having a crystalline fracture, and a pearly luster. It has a very faint odor, a bland, mild taste, and is free from rancidity.

Solubility—Spermaceti is insoluble in water, nearly insoluble in cold alcohol, and only slightly soluble in cold petroleum benzin. It is soluble in boiling alcohol, in ether, in chloroform, and in fixed and volatile oils.

Specific gravity—The specific gravity of Spermaceti is about 0.94 at 25° C.

Melting point—Spermaceti melts between 42° and 50° C., page 595.

Paraffin and free acids—Spermaceti dissolves completely in 50 parts of boiling alcohol and the solution is neutral or not more than slightly acid to moistened litmus paper.

Stearic acid—Warm a mixture of about 1 Gm. of Spermaceti and 10 cc. of ammonia T.S. in a stoppered container until the Spermaceti is melted. Shake the mixture thoroughly for a few minutes, cool, filter, and acidulate the filtrate with hydrochloric acid: the liquid may become turbid, but yields no precipitate.

Storage—Preserve Spermaceti in well-closed containers.

CHINIOFONUM

Chiniofon

Chiniofon.—Pulvis Chiniofoni U. S. P. XI, Chiniofon Powder U. S. P. XI

Chiniofon is a mixture of 7-iodo-8-hydroxyquinoline-5-sulfonic acid, its sodium salt, and sodium bicarbonate, containing not less than 26.5 per cent and not more than 29 per cent of iodine (I).

Description—Chiniofon occurs as a canary yellow powder with not more than a slight odor. It has a bitter taste, but leaves a distinctly sweetish after-taste.

Solubility—When moistened with water Chiniofon effervesces, due to the reaction between the uncombined acid and the sodium bicarbonate. The Chiniofon dissolves in 25 parts of water, but is insoluble in alcohol, in ether, and in chloroform.

Identification

A: The addition of mineral acids changes the color of Chiniofon to green and liberates free iodo-hydroxyquinolinesulfonic acid.

B: To 10 cc. of an aqueous solution of Chiniofon (1 in 100) add 5 drops of ferric chloride T.S.: a deep emerald green color is produced.

C: To 10 cc. of an aqueous solution of Chiniofon (1 in 100) add 5 cc. of cupric sulfate T.S.: a dense white precipitate is formed.

D: To 5 cc. of an aqueous solution of Chiniofon (1 in 100), add hydrochloric acid until slightly acid, then add 1 drop of sodium nitrite T.S., and shake gently with 2 cc. of chloroform: the chloroform becomes violet in color.

Free iodine—To 5 cc. of an aqueous solution of Chiniofon (1 in 100), add diluted hydrochloric acid until the reaction is slightly acid, and shake the mixture with 5 cc. of chloroform: no violet color appears in the chloroform layer.

Iodide—To 5 cc. of an aqueous solution of Chiniofon (1 in 100), add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: at most only a slight opalescence is produced.

Assay—Place about 0.4 Gm. of Chiniofon, accurately weighed, in a 500-cc. Erlenmeyer flask, and add 15 cc. of an aqueous solution of sodium hydroxide (1 in 20). Place on a steam bath, and when completely dissolved add 25 cc. of an aqueous solution of potassium permanganate (1 in 15) and several small pieces of porcelain. Rinse the inner wall of the flask with a small amount of distilled water, place a small short-stemmed funnel in the mouth of the flask, and heat the mixture on a steam bath for 1 hour, rotating the flask at 5-minute intervals. Remove the flask from the steam bath, allow the contents to cool to room temperature, and add 75 cc. of distilled water, followed by 20 cc. of diluted sulfuric acid. Add, all at once, while rotating the flask, 15 cc. of an aqueous solution of sodium bisulfite (1 in 5) and, when the solution has become colorless, add the solution of potassium permanganate, drop by drop, until a faint yellow color appears, then immediately add a solution of sodium bisulfite, drop by drop, just to discharge the color. Add 2 cc. of glacial acetic acid, 1 Gm. of dextrin, 1 Gm. of freshly powdered ammonium carbonate, and 0.5 cc. of diiodofluorescein T.S., and titrate the solution in a diffused light with tenth-normal silver nitrate until the color of the solution just changes from pale yellow to pink. Each cc. of tenth-normal silver nitrate is equivalent to 0.01269 Gm. of iodine (I).

Storage—Preserve Chiniofon in tight containers.

U. S. P. Product of Chiniofon—Tabellæ Chiniofoni.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

CHLORALIS HYDRAS

Chloral Hydrate

Chloral. Hydr.—Chloralum Hydratum, Chloral



Mol. wt. 165.42

Chloral Hydrate contains not less than 99.5 per cent of $\text{C}_2\text{H}_5\text{Cl}_3\text{O}_2$.

Description—Chloral Hydrate occurs as colorless, transparent, or white crystals, having an aromatic, penetrating, and slightly acid odor, and a slightly bitter, caustic taste. It slowly volatilizes when exposed to the air.

Solubility—One Gm. of Chloral Hydrate dissolves in 0.25 cc. of water, in 1.3 cc. of alcohol, in 2 cc. of chloroform, and in 1.5 cc. of ether, at 25° C. It is very soluble in olive oil and is freely soluble in oil of turpentine.

Identification—

A: Chloral Hydrate is decomposed by alkali and alkali earth hydroxides, chloroform and a formate of the base being produced.

B: Warm Chloral Hydrate with a few drops each of aniline and of sodium hydroxide T.S.: the mixture has the intensely disagreeable odor of phenylisocyanide. (*Caution: poisonous.*)

Ash—Chloral Hydrate yields not more than 0.10 per cent of ash, page 556.

Carbonizable substances—Shake 0.5 Gm. of Chloral Hydrate, at intervals of 5 minutes during 1 hour, with 5 cc. of sulfuric acid in a glass-stoppered cylinder that has previously been rinsed with sulfuric acid, and transfer the acid to a comparison vessel: the acid has no more color than matching fluid P, page 563.

Reaction—An alcoholic solution of Chloral Hydrate (1 in 20) does not at once redden moistened blue litmus paper.

Chloride—An alcoholic solution of Chloral Hydrate (1 in 20) does not at once become opalescent on the addition of a few drops of silver nitrate T.S.

Chloral alcoholate—Gently ignite 2 Gm. of Chloral Hydrate: no inflammable vapors are evolved.

Assay—Dissolve about 4 Gm. of Chloral Hydrate, accurately weighed, in 10 cc. of distilled water, add 30 cc. of normal sodium hydroxide, and allow the mixture to stand for 2 minutes. Add a few drops of phenolphthalein T.S., and titrate the residual alkali at once with normal sulfuric acid. Each cc. of normal sodium hydroxide corresponds to 0.1654 Gm. of $\text{C}_2\text{H}_5\text{Cl}_3\text{O}_2$.

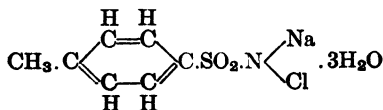
Storage—Preserve Chloral Hydrate in tight containers.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

CHLORAMINA-T

Chloramine-T

Chloram.-T—Chloramine



Mol. wt. 281.70

Chloramine-T contains the equivalent of not less than 11.5 per cent and not more than 13 per cent of active chlorine (Cl).

Description—Chloramine-T occurs as a white or faintly yellow, crystalline powder, having a slight odor of chlorine. It slowly decomposes on exposure to air, losing chlorine, and is affected by light. When heated to between 95° and 100° C., Chloramine-T loses its water of hydration without decomposition.

Solubility—One Gm. of Chloramine-T dissolves in 7 cc. of water at 25° C. and in about 2 cc. of boiling water. It dissolves in alcohol but the solution decomposes on standing. It is insoluble in chloroform, and in ether.

Identification—

A: The addition of potassium iodide T.S. to an aqueous solution of Chloramine-T (1 in 20) causes the liberation of iodine. Chloramine-T does not similarly displace bromine from alkali bromides unless the mixture is acidified (difference from dichloramine-T).

B: Acids produce in an aqueous solution of Chloramine-T (1 in 20) a white turbidity or precipitate which dissolves in an excess of an alkaline hydroxide solution. When strong mineral acids are used, chlorine is also liberated.

Carbonizable substances—Dissolve 0.2 Gm. of Chloramine-T in 5 cc. of sulfuric acid: chlorine is evolved but the solution has no more color than matching fluid A, page 563.

Reaction—An aqueous solution of Chloramine-T (1 in 20) is alkaline to litmus paper and to phenolphthalein T.S.

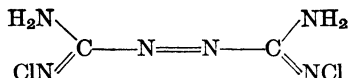
Assay—Dissolve about 0.5 Gm. of Chloramine-T, accurately weighed, in 50 cc. of distilled water, add 5 cc. of potassium iodide T.S. and 5 cc. of acetic acid, and allow the mixture to stand in a glass-stoppered flask for 10 minutes. Titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.001773 Gm. of active chlorine (Cl).

Storage—Preserve Chloramine-T in well-closed, light-resistant containers.

CHLOROAZODINUM

Chloroazodin

Chloroazodin.



Mol. wt. 183.01

Chloroazodin contains the equivalent of not less than 37.5 per cent and not more than 39.5 per cent of active chlorine (Cl).

Description—Chloroazodin occurs as bright yellow needles or flakes. It has a faint odor suggestive of chlorine, and a slightly burning taste. Solutions of Chloroazodin in glycerin and in alcohol decompose rapidly on warming, and all solutions of Chloroazodin decompose on exposure to light. Chloroazodin decomposes explosively at about 155° C. Its decomposition is accelerated by contact with metals.

Solubility—Chloroazodin is very slightly soluble in water. It is sparingly soluble in alcohol, slightly soluble in glycerin and in triacetin, and very slightly soluble in chloroform.

Identification—

A: To 5 cc. of a saturated aqueous solution of Chloroazodin add 0.25 cc. of silver ammonium nitrate T.S.: a brick red precipitate forms, which is soluble upon the addition of an excess of ammonia T.S.

- B:** To 5 cc. of a saturated aqueous solution of Chloroazodin add 2 cc. of potassium iodide T.S. and 0.5 cc. of chloroform, and agitate the mixture: the chloroform layer which separates is colorless or has only a faint color. Add 0.1 cc. of diluted hydrochloric acid to the mixture: upon further shaking the chloroform layer acquires a deep violet color.
- C:** To 5 cc. of a saturated aqueous solution of Chloroazodin add sulfurous acid T.S. dropwise until the yellow color is just discharged: the solution, when acidified with diluted nitric acid, responds to the tests for chloride, page 589.
- Ash**—Place about 2 Gm. of Chloroazodin, accurately weighed, in a porcelain crucible, add 5 cc. of hydrochloric acid, and warm the mixture gently until no more chlorine is evolved. Add 1 cc. of diluted sulfuric acid, evaporate the solution to dryness, and ignite the residue to constant weight: not more than 0.1 per cent of ash remains.
- Chloride**—A solution of 10 mg. of Chloroazodin in 40 cc. of distilled water shows no more chloride than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.
- Assay**—Transfer about 0.12 Gm. of Chloroazodin, accurately weighed, to a 250-cc. iodine flask, add, all at once, 20 cc. of glacial acetic acid, stopper the flask, and set aside until solution is complete. Add, over the loosened stopper, 10 cc. of potassium iodide T.S., again stopper the flask, mix the contents by swirling, and allow the mixture to stand in a dark place for 10 minutes. Add 50 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding a few drops of starch T.S. as the end point is neared. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.001182 Gm. of active chlorine (Cl).
- Storage**—Preserve Chloroazodin in well-closed, light-resistant containers, preferably in a cold place.
- U. S. P. Product of Chloroazodin**—Liquor Chloroazodini.

CHLOROBUTANOL

Chlorobutanol

Chlorobut.—Chlorbutol, Acetone-Chloroform



Mol. wt. 177.47

Chlorobutanol may be anhydrous or it may contain up to about one-half molecule of water.

Description—Chlorobutanol occurs as colorless to white crystals, having a characteristic, somewhat camphoraceous odor and taste.

Solubility—One Gm. of Chlorobutanol dissolves in 125 cc. of water, in about 1 cc. of alcohol, and in about 10 cc. of glycerin, at 25° C. It is readily soluble in ether, in chloroform, and in volatile oils.

Melting point—The melting point of Chlorobutanol is not below 76° C., page 595.

Identification—

A: To 5 cc. of a freshly prepared aqueous solution of Chlorobutanol (1 in 200) add 1 cc. of sodium hydroxide T.S., then slowly add 3 cc. of iodine T.S.: a yellow precipitate of iodoform appears, recognizable by its odor.

B: To 0.1 Gm. of Chlorobutanol, contained in a test tube, add 5 cc. of sodium hydroxide T.S., and mix thoroughly; then add 3 or 4 drops of aniline, and warm gently: the disagreeable odor of phenylisocyanide is produced.
(*Caution: poisonous.*)

Ash—Chlorobutanol yields not more than 0.1 per cent of ash, page 556.

Reaction—Shake thoroughly 0.5 Gm. of Chlorobutanol with 25 cc. of distilled water: the water remains neutral to litmus paper.

Chloride—Dissolve 0.5 Gm. of Chlorobutanol in 25 cc. of diluted alcohol, and add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S.: the opalescence of the

mixture is no greater than that of a mixture prepared by adding 1 cc. of silver nitrate T.S. to 0.5 cc. of fiftieth-normal hydrochloric acid and 1 cc. of nitric acid, diluted to a volume of 25 cc. with diluted alcohol.

Storage—Preserve Chlorobutanol in tight containers.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

CHLOROFORMUM

Chloroform

Chlorof.

CHCl_3

Mol. wt. 119.39

Chloroform contains not less than 99 per cent and not more than 99.5 per cent of CHCl_3 , the remainder consisting of alcohol.

Caution—Care should be taken not to vaporize Chloroform in the presence of a naked flame, because of the production of noxious gases.

Description—Chloroform is a clear, colorless, mobile liquid, having a characteristic, ethereal odor, and a burning, sweet taste. It is not inflammable, but its heated vapor burns with a green flame. It is affected by light.

Solubility—Chloroform dissolves in 210 volumes of water. It is miscible with alcohol, ether, benzene, purified benzin, and with fixed and volatile oils.

Specific gravity—The specific gravity of chloroform is not less than 1.474 and not more than 1.478 at 25° C.

Boiling point—Chloroform boils at about 61° C., but is volatile at lower temperatures.

Residue on evaporation—Evaporate 50 cc. of Chloroform in a platinum or porcelain dish on a water bath, and dry at 100° C. for 1 hour: the weight of the residue does not exceed 1 mg.

Carbonizable substances—Transfer 40 cc. of Chloroform to a glass-stoppered separator, add 5 cc. of sulfuric acid, and shake the mixture vigorously for 5 minutes. Allow the liquids to separate completely: the Chloroform remains colorless. Transfer the acid to a comparison vessel: the acid has no more color than matching fluid A, page 563.

Chloride ion and chlorine—Agitate 10 cc. of Chloroform with 25 cc. of recently boiled and cooled distilled water, and allow the liquids to separate completely. The aqueous layer is neutral to litmus paper, and separate portions of 10 cc. each are not affected by a few drops of silver nitrate T.S. (*chloride*), or colored blue by the addition of a few drops each of potassium iodide T.S. and starch T.S. (*free chlorine*).

Odorous and chlorinated decomposition products—Dilute 2 cc. of the sulfuric acid separated from the Chloroform in the test for *carbonizable substances* with 5 cc. of distilled water: the liquid is colorless and clear, and while hot from the mixing emits but a faint vinous or ethereal odor (*odorous decomposition products*). When further diluted with 10 cc. of distilled water, it remains clear, and is not affected within 1 minute by the addition of 3 drops of silver nitrate T.S. (*chlorinated decomposition products*).

Acids and phosgene—Into each of two 50-cc. glass-stoppered cylinders of colorless glass, having an internal diameter of 20 mm., place 10 cc. of distilled water, 2 drops of phenolphthalein T.S., and enough hundredth-normal sodium hydroxide to produce, after vigorous shaking, pink tints of equal intensity. Into one of the cylinders measure exactly 20 cc. of chloroform, and again shake the mixture well.

Add hundredth-normal sodium hydroxide, dropwise from a burette, shaking the mixture well after each addition, until the pink color is reproduced in an intensity equal to that in the cylinder without the Chloroform. Not more than 0.20 cc. of hundredth-normal sodium hydroxide is required to produce a pink color which persists for 15 minutes.

Aldehydes and ketones—Agitate 3 cc. of Chloroform with 10 cc. of ammonia-free distilled water in a glass-stoppered cylinder for 5 minutes. After the liquids separate, transfer 5 cc. of the aqueous extract to another glass-stoppered cylinder containing 40 cc. of ammonia-free distilled water, and add 5 cc. of alkaline mercuric potassium iodide T.S.: no turbidity or precipitate develops within 1 minute.

Foreign odor—Pour 20 cc. of Chloroform, in small portions, upon a piece of clean, odorless, filter paper laid flat upon a warmed glass plate, and rock the plate from side to side until the liquid is completely evaporated: no foreign odor becomes perceptible as the last portions of liquid disappear from the paper, and the paper remains odorless.

Storage—Preserve Chloroform in tight, light-resistant containers. If cork stoppers are used, they should be covered with tin foil or other suitable material. It is recommended that Chloroform be kept at a temperature which does not exceed 30° C.

U. S. P. Products of Chloroform—Aqua Chloroformi, Linimentum Chloroformi.

CHORDA CHIRURGICALIS

Surgical Gut

Chord. Chirurg.—Surgical "Catgut," "Catgut" Suture

Surgical Gut consists of sterile gut prepared from the longitudinally split segment of submucous connective tissue of the small intestine of healthy sheep, *Ovis aries* Linné (Fam. *Bovidae*).

Description—Surgical Gut is either plain gut which has not been treated in any manner which will alter its normal rate of digestibility, known as *Type A, Plain or Untreated*, or it is gut which has been tanned or otherwise treated so that it will resist digestion for longer but varying periods of time, and known respectively as *Type B, Mild Treatment*; *Type C, Medium Treatment*; and *Type D, Prolonged Treatment*. One form of treatment is frequently referred to as *Chromic*. The types mentioned are supplied as *Boilable* or as *Non-boilable* Surgical Gut. Surgical Gut is uniformly and firmly twisted.

Caution—The tubes of Surgical Gut marked "Non-boilable" must not be subjected to heat. Tubes marked "Boilable" may be heated for purposes of sterilizing the outside of the tube.

Length—Determine the length of Surgical Gut immediately after removal from the tube and without any stretching; the actual length of each strand is not less than 90 per cent of the length stated on the label.

Diameter—Determine the diameter of Surgical Gut immediately after removal from the tube and without stretching as directed under *Diameter of Sutures*, page 576. Determine the diameter of the Gut at three quarterly points of the strands in 12 tubes, which may represent either a single commercial package or which may be drawn at random from a lot. At least 2 of the measurements on each of not less than 10 of the strands shall conform to the required diameter for the size indicated on the label, and at least one measurement of each of the remaining strands shall conform to the requirement. In no case shall any measurement vary more than the required diameter of the size next above or below.

Diameter of Surgical Gut								
Size	Boilable				Non-boilable			
	Millimeter		Inch		Millimeter		Inch	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
0000000	0.025	0.051	0.001	0.002	0.025	0.064	0.0010	0.0025
000000	0.051	0.102	0.002	0.004	0.064	0.113	0.0025	0.0045
00000	0.102	0.152	0.004	0.006	0.113	0.179	0.0045	0.0070
0000	0.152	0.203	0.006	0.008	0.179	0.241	0.0070	0.0095
000	0.203	0.254	0.008	0.010	0.241	0.318	0.0095	0.0125
00	0.254	0.330	0.010	0.013	0.318	0.406	0.0125	0.0160
0	0.330	0.406	0.013	0.016	0.406	0.495	0.0160	0.0195
1	0.406	0.483	0.016	0.019	0.495	0.584	0.0195	0.0230
2	0.483	0.559	0.019	0.022	0.584	0.673	0.0230	0.0265
3	0.559	0.635	0.022	0.025	0.673	0.762	0.0265	0.0300
4	0.635	0.711	0.025	0.028	0.762	0.864	0.0300	0.0340
5	0.711	0.813	0.028	0.032	0.864	0.978	0.0340	0.0385
6	0.813	0.914	0.032	0.036	0.978	1.105	0.0385	0.0435
7	0.914	1.016	0.036	0.040	1.105	1.219	0.0435	0.0480

Tensile strength—Determine the tensile strength of Surgical Gut, immediately after removal from the tube and without drying, both on a straight pull and over a surgeon's knot, as directed under *Tensile Strength Determination*, page 621. Divide each strand into two parts, and use one part for the straight pull and the other for the surgeon's knot, thus obtaining two breaks on each strand. The minimum tensile strength of each size, calculated on the average strength of 10 strands from any lot, is as follows:

Tensile Strength of Surgical Gut		
Size	Minimum Tensile Strength of Surgical Gut in Avoirdupois Pounds	
	On Straight Pull	Over a Surgeon's Knot
0000000	0.25	0.125
000000	0.5	0.25
00000	1	0.5
0000	2	1.0
000	3	2.0
00	5	3.0
0	7	5.0
1	10	7.0
2	13	9.0
3	16	11.0
4	20	13.0
5	25	17.0
6	30	21.0
7	35	25.0

Soluble chromium compounds—Place 5 Gm. of Surgical Gut, as far as possible in whole strands, in 250 cc. of distilled water and set aside for three hours, agitating occasionally. Filter into an evaporating dish, evaporate the filtrate to dryness on a water bath, add 0.25 Gm. of a mixture of equal parts of potassium carbonate and potassium nitrate to the dried residue and fuse the mixture. Cool, dissolve the cooled mass in 25 cc. of distilled water: the solution shows no yellow tinge or color when observed against a white background in a color-comparison tube, 25 mm. in diameter.

Sterility—Surgical Gut meets the requirements of the *Sterility Tests for Solids*, page 610.

Labeling—Each tube and each package of Surgical Gut shall indicate the size and type of Gut, whether "non-boilable" or "boilable," and also the name of the

manufacturer. The package shall also indicate the address of the manufacturer, the lot number identifying the method and time of sterilization of the Gut, and the composition of any tubing fluid used.

Storage—Preserve each strand of Surgical Gut in an individual, hermetically sealed glass tube.

CHORDA SERICA CHIRURGICALIS

Surgical Silk

Chord. Ser. Chirurg.—Silk Sutures

Surgical Silk consists of the thread prepared from the cocoon filaments of glutinous gum which are secreted or spun by the mulberry silkworm, *Bombyx mori* Linné (Fam. *Bombycidae*). The strands may be processed to form threads of various diameters by braiding or twisting, or a combination of both.

Note—Surgical Silk may be sterilized by exposing the strands to saturated steam at 15 pounds pressure (121.5° C.) for 30 minutes.

Description—Surgical Silk, may be white or colored. *White* Surgical Silk consists of degummed silk which has not been subjected to any bleaching process. *Colored* Surgical Silk consists of degummed silk which has been "iron dyed," or dyed with a harmless vegetable dye, or a certified coal tar color. All uncombined dye shall be removed from the material, so that the color of the suture will not bleed into the tissue.

Surgical Silk may consist of pure silk which is capillary, known as Type A, *Untreated or Capillary*; or it may consist of pure silk which has been treated to reduce its capillarity, known as Type B, *Treated or Non-Capillary*.

Length—Determine the length of Surgical Silk while the strand is laid out smooth, without tension, on a plane surface: the actual length of each strand is not less than 90 per cent of the length stated on the label.

Diameter of Surgical Silk					Tensile Strength of Surgical Silk
Size	Millimeter		Inch		Minimum Tensile Strength of Surgical Silk in Avoirdupois Pounds, on Straight Pull
	Min.	Max.	Min.	Max.	
0000000	0.025	0.051	0.001	0.002	0.25
000000	0.051	0.102	0.002	0.004	0.5
00000	0.102	0.152	0.004	0.006	1
0000	0.152	0.203	0.006	0.008	2
000	0.203	0.254	0.008	0.010	3
00	0.254	0.330	0.010	0.013	5
0	0.330	0.406	0.013	0.016	7
1	0.406	0.483	0.016	0.019	10
2	0.483	0.559	0.019	0.022	13
3	0.559	0.635	0.022	0.025	16
4	0.635	0.711	0.025	0.028	20
5	0.711	0.813	0.028	0.032	25
6	0.813	0.914	0.032	0.036	30
7	0.914	1.016	0.036	0.040	35

Diameter—Determine the diameter of Surgical Silk as directed under *Diameter of Sutures*, page 576, the strand being held under a tension equal to one-fourth of the required minimum tensile strength of the size of Silk being tested, without being permitted to untwist. The diameter of Surgical Silk, taken at three quarterly points on each strand, and calculated as the average diameter of 5 strands taken from any one lot, meets the requirements of the table on page 133.

Tensile strength—Determine the tensile strength of Surgical Silk by the straight pull test as directed under the *Tensile Strength Determination*, page 621, using the Incline Plane Tester. Expose the Silk for at least 4 hours to an atmosphere having a relative humidity of 65 per cent, ± 2 per cent, and a temperature of 21° C., $\pm 1.1^{\circ}$ C. (70° F., $\pm 2^{\circ}$ F.), and determine the tensile strength in this atmosphere. The minimum tensile strength of the various sizes of Surgical Silk, determined on the average strength of at least 5 strands from any one lot, and making at least 2 breaks on each strand, meets the requirements of the above table. If the labeled length of the strand is not less than 25 yards, take 2 yards from each of 5 strands selected at random from the lot, rejecting the first 12 inches, and make at least 2 breaks on each strand.

Labeling—The type, construction, size, and length of Surgical Silk shall be stated on the package.

Storage—Preserve Surgical Silk in well-closed containers.

CHORDA SERICA CHIRURGICALIS STERILIS

Sterile Surgical Silk

Chord. Ser. Chirurg. Steril.—Sterile Silk Sutures

Sterile Surgical Silk is Surgical Silk which has been rendered sterile and protected from contamination by suitable packaging.

Description—Sterile Surgical Silk agrees with the *Description* and conforms to the requirements for *Length* and *Diameter* under *Chorda Serica Chirurgicallis*, page 133.

Tensile strength—Sterile Surgical Silk when packaged dry conforms to the requirements for *Tensile strength* under *Chorda Serica Chirurgicallis*, page 134. Sterile Surgical Silk that has been packaged in a tubing fluid has a tensile strength, determined immediately after removal from the tubing fluid and without drying, not less than 80 per cent of that required for the same size of *Chorda Serica Chirurgicallis*, page 133.

Sterility—Sterile Surgical Silk meets the *Sterility Tests for Solids*, page 610.

Labeling—Each container of one or more strands of Sterile Surgical Silk, and each package of one or more containers shall indicate the size and type and also the name of the manufacturer. The package shall also indicate the address of the manufacturer, the lot number identifying the method and time of sterilization of the Silk, and, if a tubing fluid is used, its composition shall be stated on the package.

Storage—Preserve Sterile Surgical Silk in hermetically sealed glass tubes or in other containers holding not more than 2 strands, and which will maintain the sterility of the Silk until the container is opened for use. The Silk may be packaged in a suitable tubing fluid. Unless hermetically sealed in glass tubes, the containers of Sterile Surgical Silk must be grouped in a second protective container. Sterile Surgical Silk must be sterilized in the container.

CHROMII TRIOXIDUM

Chromium Trioxide

Chrom. Triox.—Chromic Anhydride

CrO_3

Mol. wt. 100.01

Chromium Trioxide contains not less than 98 per cent of CrO_3 .

Caution—Chromium Trioxide should not be brought into intimate contact with organic substances, as serious explosions are likely to result.

Description—Chromium Trioxide occurs as dark purplish red crystals, often needle-like, or in flakes. It is deliquescent, and is destructive to animal and vegetable tissues.

Solubility—One Gm. of Chromium Trioxide is soluble in 0.6 cc. of water at 25° C.

Identification—

A: When Chromium Trioxide is warmed with hydrochloric acid, chlorine is evolved.

B: Chromium Trioxide responds to the test for chromate, page 589.

Alkali salts—Carefully ignite 0.5 Gm. of Chromium Trioxide in a porcelain crucible, cool, and triturate with 10 cc. of hot distilled water. Filter through a small paper, using 10 cc. of hot distilled water to wash the residue in the crucible and on the filter paper. Evaporate the filtrate to dryness, and ignite the residue. Treat the residue with 10 cc. of distilled water, filter, wash with 5 cc. of hot distilled water, evaporate the filtrate to dryness, and ignite to constant weight: the weight of the residue does not exceed 2 mg.

Sulfate—Dissolve 1 Gm. of Chromium Trioxide in 100 cc. of distilled water, previously acidulated with 3 cc. of hydrochloric acid, and add 1 cc. of barium chloride T.S.: the mixture does not become turbid within 1 minute.

Assay—Dissolve about 1 Gm. of Chromium Trioxide, accurately weighed in a stoppered weighing bottle, in sufficient distilled water to make the solution measure 100 cc. Place in a 500-cc. glass-stoppered Erlenmeyer flask 4 Gm. of potassium iodide, and 100 cc. of distilled water. When the salt is dissolved, add 5 cc. of hydrochloric acid slowly and exactly 15 cc. of the Chromium Trioxide solution. Mix well, insert the stopper, and set aside in the dark for 5 minutes. Add 200 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003334 Gm. of CrO_3 .

Storage—Preserve Chromium Trioxide in tight containers.

CHRY SAROBINUM

Chrysarobin

Chrysarob.

Chrysarobin is a mixture of neutral principles obtained from Goa powder, a substance deposited in the wood of *Andira Araroba* Aguiar (Fam. *Leguminosæ*).

Description—Chrysarobin occurs as a brown to orange yellow, microcrystalline powder. It is odorless and tasteless, and is irritating to the mucous membrane. **Solubility**—Chrysarobin is very slightly soluble in water. One Gm. of it dissolves in 400 cc. of alcohol, in 15 cc. of chloroform, and in about 160 cc. of ether, at 25° C.

Identification—

A: Chrysarobin dissolves in solutions of alkali hydroxides, producing deep red solutions.

B: Chrysarobin dissolves in sulfuric acid, producing a deep red solution. When the solution is poured into water, the Chrysarobin separates from the mixture.

C: Mix about 2 mg. of Chrysarobin with 2 drops of fuming nitric acid: the mixture is red brown. Add a few drops of ammonia T.S.: the color changes to violet red (chrysophanic acid produces a yellow color).

Ash—Chrysarobin yields not more than 0.3 per cent of ash, page 556.

Reaction—Boil 0.1 Gm. of Chrysarobin with 20 cc. of distilled water, and filter the mixture: the filtrate is neutral to litmus paper.

Storage—Preserve Chrysarobin in well-closed containers.

U. S. P. Product of Chrysarobin—Unguentum Chrysarobini.

CINNAMOMUM

Cinnamon

Cinnam.—Saigon Cinnamon

Cinnamon is the dried bark of *Cinnamomum Loureirii* Nees (Fam. Lauraceæ).

Cinnamon yields, from each 100 Gm., not less than 2.5 cc. of oil of cinnamon and contains not more than 2 per cent of foreign organic matter, page 628.

Description—

Unground Cinnamon—In quills up to 30 cm. long and 4 cm. in diameter, the bark from 0.5 to 7.0 mm. in thickness, or in broken irregular pieces or in flattened slabs up to 10 mm. in thickness; the outer surface light brown to dark purplish brown, often with grayish patches of crustose lichens and numerous bud-scars, finely longitudinally wrinkled when from young twigs, otherwise, more or less rough from corky patches surrounding the lenticels; inner surface reddish brown to dark brown, granular and slightly striate; fracture short; odor characteristic and aromatic; taste sweetish, aromatic and pungent.

Histology—A narrow outer layer of more or less lignified cork cells followed by a zone of starch-bearing parenchyma with scattered stone cells, mucilage and oil cells and a nearly continuous zone of stone cells among which are small groups of pericyclic fibers with thickened and slightly lignified walls; inner bark with medullary rays 1 to 3 cells wide, inconspicuous sieve tissue, bast-fibers isolated and in groups of 2 to 20, mucilage and oil cells numerous and about the size of the parenchyma cells; parenchyma cells usually filled with starch or containing very small raphides of calcium oxalate; the lumina of parenchyma cells, stone cells and fibers frequently filled with an amorphous reddish brown substance, which is for the most part insoluble in the ordinary reagents. In the bark of the young twigs there is an epidermal layer with a thick, yellowish cuticle, fewer stone cells in the zone associated with pericyclic-fibers, the inner bark narrower and with fewer secretion cells than in the older bark.

Powdered Cinnamon—Yellowish brown or reddish brown; starch grains numerous; single and 2- to 4-compound, the single grains from 5 to 25 microns in diameter; stone cells irregular in shape, occasionally with one wall much thinner than the other walls, sometimes containing starch; fibers from 300 to 1500 microns in length, with very thick, more or less wavy and slightly lignified walls; parenchyma cells with reddish brown walls; oil cells and mucilage cells not readily distinguishable; fragments of somewhat lignified cork.

Assay—Proceed as directed for the *Volatile Oil Determination*, page 632.

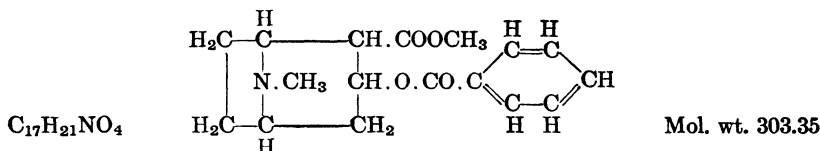
Storage—Preserve Cinnamon in well-closed containers.

U. S. P. Products of Cinnamon—Aqua Cinnamomi, Oleum Cinnamomi, Spiritus Cinnamomi.

COCAINA

Cocaine

Cocain.



Cocaine is an alkaloid obtained from the leaves of *Erythroxylon Coca* Lamarck and other species of *Erythroxylon* (Fam. *Erythroxylaceæ*), or by synthesis from ecgonine or its derivatives.

Description—Cocaine occurs as colorless to white crystals, or as a white, crystalline powder. A solution of cocaine in diluted hydrochloric acid is laevorotatory.

Solubility—One Gm. of Cocaine dissolves in about 600 cc. of water, in 7 cc. of alcohol, in 1 cc. of chloroform, in 3.5 cc. of ether, in about 12 cc. of olive oil, and in from 80 to 100 cc. of liquid petrolatum, at 25° C. It is very soluble in warm alcohol.

Melting point—Cocaine melts between 96° and 98° C., page 595.

Identification—

- A: Heat about 0.1 Gm. of powdered Cocaine with 1 cc. of sulfuric acid for 5 minutes at 100° C., then cautiously mix with 2 cc. of distilled water: the mixture has the aromatic odor of methyl benzoate, and upon cooling, yields crystals of benzoic acid.
- B: Dissolve 0.1 Gm. of Cocaine in 0.4 cc. of normal hydrochloric acid and enough distilled water to make 5 cc., and add 5 drops of a solution of chromium trioxide (1 in 20): a yellow precipitate is produced which redissolves on shaking the mixture. On the addition of 1 cc. of hydrochloric acid a permanent, orange-colored, crystalline precipitate is formed.
- C: Dissolve 10 mg. of Cocaine in 1 cc. of fiftieth-normal hydrochloric acid, and evaporate the solution just to dryness on a water bath. Dissolve the residue in 2 drops of distilled water, and add 1 cc. of tenth-normal potassium permanganate: a violet, crystalline precipitate forms, which appears brownish violet when collected on a filter, and shows characteristic violet red crystalline aggregates under the low power of a microscope.

Loss on drying—When dried over sulfuric acid for 18 hours, Cocaine loses not more than 1 per cent of its weight.

Ash—The ash from 0.5 Gm. of Cocaine is negligible, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Cocaine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—A saturated aqueous solution of Cocaine is alkaline to litmus paper.

Cinnamyl-cocaine and other reducing substances—Dissolve 0.3 Gm. of finely powdered Cocaine in 1 cc. of normal hydrochloric acid with the aid of heat, if necessary, and dilute with distilled water to 15 cc. Mix 5 cc. of this solution with 0.3 cc. of normal sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate: the violet color of the mixture does not disappear entirely within 30 minutes.

Isotropy-cocaine—Dilute in a beaker 5 cc. of the aqueous solution of Cocaine prepared in the test for cinnamyl-cocaine with 80 cc. of distilled water, add 0.2 cc. of

ammonia T.S., and stir the solution vigorously during 5 minutes, occasionally rubbing the inner wall of the beaker with a stirring rod: the solution develops a crystalline precipitate of cocaine and the supernatant liquid is clear.

Storage—Preserve Cocaine in well-closed, light-resistant containers.

U. S. P. Product of Cocaine—Cocainæ Hydrochloridum.

COCAINÆ HYDROCHLORIDUM

Cocaine Hydrochloride

Cocain. Hydrochlor.—Cocaini hydrochloridum P.I.

$C_{17}H_{21}NO_4 \cdot HCl$

Mol. wt. 339.81

Description—Cocaine Hydrochloride occurs as colorless crystals, or as a white, crystalline powder.

Solubility—One Gm. of Cocaine Hydrochloride dissolves in 0.5 cc. of water, in 3.5 cc. of alcohol, and in 15 cc. of chloroform, at 25° C. It is soluble in glycerin and insoluble in ether.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Cocaine Hydrochloride, determined in an aqueous solution containing the equivalent of 2 Gm. of the salt, previously dried for 18 hours over sulfuric acid, in 100 cc. of the solution and using a 200-mm. tube, is not less than -71° and not more than -73° , page 601.

Identification—

A: Heat about 0.1 Gm. of powdered Cocaine Hydrochloride with 1 cc. of sulfuric acid for 5 minutes at 100° C., then cautiously mix with 2 cc. of distilled water: the mixture has the aromatic odor of methyl benzoate and on cooling yields crystals of benzoic acid.

B: Add 5 drops of a solution of chromium trioxide (1 in 20) to 5 cc. of a solution of Cocaine Hydrochloride (1 in 50): a yellow precipitate is produced which redissolves on shaking the mixture. On the addition of 1 cc. of hydrochloric acid, a permanent, orange-colored crystalline precipitate is formed.

C: A solution of about 10 mg. of Cocaine Hydrochloride in 2 drops of distilled water yields, on the addition of 1 cc. of tenth-normal potassium permanganate, a violet, crystalline precipitate which appears brownish violet when collected on a filter, and shows characteristic, violet red crystalline aggregates under the low power of a microscope.

D: Silver nitrate T.S. produces, in an aqueous solution of Cocaine Hydrochloride (1 in 20), a white precipitate insoluble in nitric acid.

Loss on drying—When dried over sulfuric acid for 18 hours, Cocaine Hydrochloride loses not more than 1 per cent of its weight.

Ash—The ash from 0.5 Gm. of Cocaine Hydrochloride is negligible, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Cocaine Hydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid F, page 563.

Acidity—A solution of 0.5 Gm. of Cocaine Hydrochloride in 10 cc. of distilled water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Cinnamyl-cocaine and other reducing substances—Mix 5 cc. of an aqueous solution of Cocaine Hydrochloride (1 in 50) with 0.3 cc. of normal sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate: the violet color of the mixture does not disappear entirely within 30 minutes.

Isoatropyl-cocaine—Dilute 5 cc. of an aqueous solution of Cocaine Hydrochloride (1 in 50) in a beaker with 80 cc. of distilled water, add 0.2 cc. of ammonia T.S., and stir the solution vigorously during 5 minutes, occasionally rubbing the inner wall of the beaker with a stirring rod: the solution develops a crystalline precipitate of cocaine and the supernatant liquid is clear.

Storage—Preserve Cocaine Hydrochloride in well-closed, light-resistant containers.

COCCUS

Cochineal

Cochineal consists of the dried female insects, *Coccus cacti* Linné (Fam. *Coccidæ*), enclosing the young larvæ.

Description—

Unground Cochineal—Somewhat ovate in outline, dorsal surface convex, and showing from 9 to 12 segments, ventral surface concave, from 3.5 to 6 mm. in length; externally grayish to grayish purple or purplish black to very dusky red purple; the ventral surface showing two straight, 7-jointed antennæ located in the anterior end, three pairs of short legs each terminating in a single claw and a highly modified mouth showing externally a long filiform proboscis composed of four very fine chitinous styles, in two pairs, the anterior pair representing the mandibles and the posterior pair representing the first maxillæ; the antennæ, legs, and mouth parts being more or less broken; four spiracles are visible, an anterior pair between the middle and hind legs; entire surface more or less chitinous and showing numerous solitary or clustered, tubular or spinneret wax glands; the insect, after decolorization, exhibiting numerous larvæ characterized by their proboscides appearing as two circular coils, rows of tubular wax glands, and in the more developed stages, three pairs of legs, antennæ and other features of the mature insect; easily pulverizable; odor characteristic; taste slightly bitter.

Powdered Cochineal—Very dusky to very dark red; showing fragments of muscle fibers; portions of the chitinous epidermis with wax glands; fragments of larvæ with coiled proboscides; occasional claws and segments of the legs; fragments of antennæ and other parts described under the unground drug.

Identification—The red color of Cochineal solutions is changed to reddish purple by alkalis and to weak orange by acids.

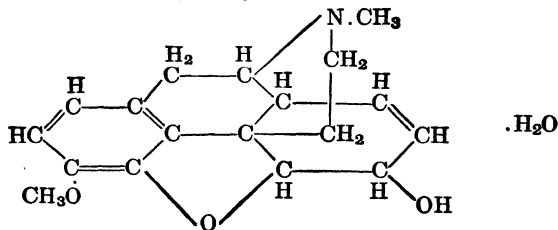
Weighting materials—When whole Cochineal is macerated in water, no insoluble powder separates.

Storage—Preserve Cochineal in well-closed containers.

CODEINA

Codeine

Codein.



$C_{18}H_{21}O_3N \cdot H_2O$

Mol. wt. 317.37

Codeine is an alkaloid obtained from opium or prepared from morphine by methylation.

Description—Codeine occurs as colorless to white crystals, or as a white, crystalline powder. It effloresces slowly in dry air and is affected by light. In acid or alcoholic solutions it is levorotatory.

Solubility—One Gm. of Codeine dissolves in 120 cc. of water, in 2 cc. of alcohol, in about 0.5 cc. of chloroform, and in 50 cc. of ether, at 25° C. When heated in an amount of water insufficient for complete solution, Codeine melts to oily drops which crystallize on cooling.

Melting point—Codeine, rendered anhydrous by drying at 80° C., melts between 154° and 156° C., page 595.

Identification—

A: Sulfuric acid containing 5 mg. of selenous acid in each cc. produces with Codeine a green color, which changes rapidly to blue, then slowly back to green.

B: Dissolve about 10 mg. of Codeine in 5 cc. of sulfuric acid, add a drop of ferric chloride T.S., and warm the mixture: the solution becomes blue, but changes to red on the addition of a drop of nitric acid.

Loss on drying—When dried to constant weight at 80° C., Codeine loses not more than 6 per cent of its weight.

Ash—The ash from 0.5 Gm. of Codeine is negligible, page 556.

Carbonizable substances—Dissolve 10 mg. of Codeine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid S, page 563.

Reaction—A saturated, aqueous solution of Codeine is alkaline to litmus paper.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of distilled water, and add 1 drop of ferric chloride T.S. and 1 cc. of a neutral or slightly acid aqueous solution of Codeine (1 in 100) made with the aid of sulfuric acid: no blue color is produced at once in the solution.

Storage—Preserve Codeine in tight, light-resistant containers.

U. S. P. Products of Codeine—Codeinæ Phosphas, Codeinæ Sulfas, Tabellæ Codeinæ Phosphatis, Tabellæ Codeinæ Sulfatis.

AVERAGE DOSE—Metric, 30 mg.—Apothecaries, ½ grain.

CODEINÆ PHOSPHAS

Codeine Phosphate

Codein. Phos.

$C_{18}H_{21}O_3N \cdot H_3PO_4 \cdot 1\frac{1}{2}H_2O$

Mol. wt. 424.39

Codeine Phosphate contains not less than 70 per cent of anhydrous codeine ($C_{18}H_{21}O_3N$).

Description—Codeine Phosphate occurs as fine, white, needle-shaped crystals or as a white, crystalline powder. It is odorless. It readily loses water of hydration on exposure to air and is affected by light.

Solubility—One Gm. of Codeine Phosphate dissolves in 2.5 cc. of water, and in 325 cc. of alcohol, at 25° C. One Gm. dissolves in 0.5 cc. of water at 80° C., and in 125 cc. of boiling alcohol.

Identification—

A: Sulfuric acid containing 5 mg. of selenous acid in each cc. produces with Codeine Phosphate a green color, which rapidly changes to blue, then slowly back to green.

B: Dissolve about 10 mg. of Codeine Phosphate in 5 cc. of sulfuric acid, add a drop of ferric chloride T.S., and warm the mixture: the solution becomes blue, but changes to red on the addition of a drop of nitric acid.

C: An aqueous solution of Codeine Phosphate neutralized with ammonia T.S., and treated with silver nitrate T.S. produces a yellow precipitate which is soluble in diluted nitric acid and in ammonia T.S.

Reaction—An aqueous solution of Codeine Phosphate (1 in 20) is acid to litmus paper.

Chloride—A 10-cc. portion of an aqueous solution of Codeine Phosphate (1 in 100)

shows no opalescence on the addition of a few drops of silver nitrate T.S. and 2 drops of nitric acid.

Sulfate—A 10-cc. portion of an aqueous solution of Codeine Phosphate (1 in 100) shows no turbidity at once on the addition of a few drops of barium chloride T.S.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of distilled water, and add 1 drop of ferric chloride T.S. and 1 cc. of an aqueous solution of Codeine Phosphate (1 in 100): no blue color is produced at once.

Assay—Dissolve about 0.5 Gm. of Codeine Phosphate, accurately weighed, in 10 cc. of distilled water in a separator, add 10 cc. of sodium hydroxide T.S., and extract the codeine with four successive portions of 15 cc., 10 cc., 10 cc., and 5 cc. of chloroform, or a sufficient quantity to complete the extraction. Shake the combined chloroform solutions with 5 cc. of distilled water, and completely separate the chloroform from the aqueous layer. Evaporate the chloroform solution almost to dryness on a water bath, dissolve the residue by warming it with 15 cc. of tenth-normal sulfuric acid, heat the solution on a water bath until it no longer has a perceptible odor of chloroform, cool, dilute with about 10 cc. of distilled water, and titrate the excess of acid with tenth-normal sodium hydroxide, using 2 drops of methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.02994 Gm. of anhydrous codeine ($C_{18}H_{21}O_3N$).

Storage—Preserve Codeine Phosphate in tight, light-resistant containers.

U. S. P. Product of Codeine Phosphate—*Tabellæ Codeinæ Phosphatis*.

AVERAGE DOSE—Metric, 30 mg.—Apothecaries, $\frac{1}{2}$ grain.

CODEINÆ SULFAS

Codeine Sulfate

Codein. Sulf.

$(C_{18}H_{21}O_3N)_2 \cdot H_2SO_4 \cdot 5H_2O$

Mol. wt. 786.87

Description—Codeine Sulfate occurs as white crystals, usually needle-like, or as a white, crystalline powder. It effloresces in dry air and is affected by light.

Solubility—One Gm. of Codeine Sulfate dissolves in 30 cc. of water and in 1280 cc. of alcohol, at 25° C. One Gm. dissolves in 6.5 cc. of water at 80° C. It is insoluble in chloroform and in ether.

Identification—

A: Sulfuric acid containing 5 mg. of selenous acid in each cc. produces with Codeine Sulfate a green color, which changes rapidly to blue, then slowly back to green.

B: Dissolve about 10 mg. of Codeine Sulfate in 5 cc. of sulfuric acid, add 1 drop of ferric chloride T.S., and warm the mixture: the solution becomes blue, but changes to red on the addition of 1 drop of nitric acid.

C: Codeine Sulfate responds to the test for sulfate, page 592.

Loss on drying—When dried to constant weight at 100° C., Codeine Sulfate loses not more than 12 per cent of its weight.

Ash—The ash from 0.5 Gm. of Codeine Sulfate is negligible, page 556.

Carbonizable substances—Dissolve 10 mg. of Codeine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid S, page 563.

Free acid—A solution of 0.5 Gm. of Codeine Sulfate in 15 cc. of distilled water requires not more than 0.3 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of distilled water, and add 1 drop of ferric chloride T.S. and 1 cc. of an aqueous solution of Codeine Sulfate (1 in 100): no blue color is produced at once in the solution.

Storage—Preserve Codeine Sulfate in tight, light-resistant containers.

U. S. P. Product of Codeine Sulfate—*Tabellæ Codeinæ Sulfatis*.

AVERAGE DOSE—Metric, 30 mg.—Apothecaries, $\frac{1}{2}$ grain.

COLCHICI SEMEN

Colchicum Seed

Colch. Sem.—*Colchici semen* P.I.

Colchicum Seed is the dried ripe seed of *Colchicum autumnale* Linné (Fam. *Liliaceæ*).

Colchicum Seed yields not less than 0.45 per cent of colchicine.

Description—

Unground Colchicum Seed—Ovoid or irregularly globular, amphitropous, minutely pointed at the hilum, and with a distinct beak or caruncle approximately opposite the hilum; from 2 to 3 mm. in diameter and, when fresh, with a tendency to cohere in small clumps; externally weak reddish brown to dark brown, finely pitted; tough and of bony hardness; internally pale yellow, yellowish gray or light brown; nearly inodorous; taste bitter and acrid.

Histology—Seed-coat of a few layers of more or less collapsed cells with thin, reddish brown, orange or olive brown walls; the endosperm parenchyma, with thick, porous walls, containing fixed oil and aleurone grains, the latter from 3 to 15 microns in diameter; the embryo small; the beaked portion or swollen raphe containing thin-walled parenchyma with ovoid, ellipsoidal, or polygonal starch grains from 5 to 20 microns in diameter.

Assay—Weigh accurately 15 Gm. of Colchicum Seed, in moderately fine powder, and place it in a suitable flask. Add exactly 290 cc. of distilled water and exactly 10 cc. of lead subacetate T.S., and weigh the flask and contents. Digest the mixture at a temperature of from 60° to 70° C. for 3 hours with frequent agitation. Cool, add distilled water to the flask to restore the original weight, and filter into a dry flask, rejecting the first 20 cc. of the filtrate. To 200 cc. of the subsequent clear filtrate add, in small portions, sufficient sodium phosphate (about 2 Gm.) to precipitate the lead completely, shake the mixture frequently during 30 minutes, and filter into a dry flask, rejecting the first 20 cc. of the filtrate. Extract the alkaloids completely from 100 cc. of the filtrate by shaking with successive portions of chloroform (see *Extraction of Drugs*, page 603). Test for complete extraction with iodine T.S. Carefully evaporate the combined chloroform extracts in a tared flask to dryness on a steam bath, then add to the residue 1 cc. of alcohol, and again evaporate to dryness. Again evaporate the residue with 1 cc. of alcohol, and then dry to constant weight at 100° C.

Add to the residue 1 cc. of chloroform, 5 cc. of tenth-normal sulfuric acid, and 5 cc. of distilled water, and heat the mixture at 70° C. for about 10 minutes, to dissolve the alkaloid and to evaporate the chloroform completely. Filter the solution through a pledget of purified cotton or a small filter paper, and wash the flask and the filter with distilled water until the washings show not more than a faint turbidity with iodine T.S. Drain the filter by application of suction to remove as much water as possible, and discard the filtrate and washings. Dissolve any residue on the filter by washing it first with alcohol and then with ether. Collect the alcohol and ether filtrates in the flask in which the alkaloid was weighed, evaporate to dryness, and dry the residue to constant weight at 100° C. Deduct

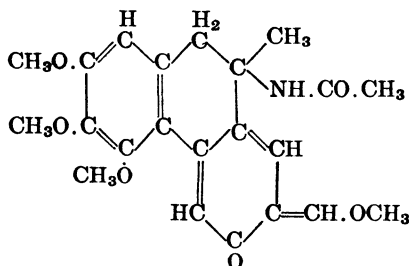
this weight from the weight of the residue previously obtained: the difference represents the quantity of colchicine yielded by 5 Gm. of *Colchicum* Seed.

Storage—Preserve *Colchicum* Seed in well-closed containers.

U. S. P. Products of *Colchicum* Seed—*Colchicina*, *Tabellæ Colchicinæ*, *Tinctura Colehici Seminis*.

COLCHICINA

Colchicine



$C_{22}H_{25}NO_6$

Mol. wt. 399.43

Colchicine is an alkaloid obtained from *Colchicum autumnale* Linné (Fam. *Liliaceæ*).

Description—Colchicine occurs as pale yellow, amorphous scales, or powder. It is odorless or nearly so, and darkens on exposure to light. It is levorotatory in aqueous solution.

Caution—*Colchicine is extremely poisonous.*

Solubility—One Gm. of Colchicine dissolves in 25 cc. of water, and in about 220 cc. of ether, at 25° C. It is freely soluble in alcohol and in chloroform.

Melting point—Colchicine, dried over sulfuric acid for 24 hours, melts between 142° and 150° C., page 595.

Identification—

A: An aqueous solution of Colchicine (1 in 30) is yellow, its color being intensified by the addition of inorganic acids.

B: Mix about 1 mg. of Colchicine with a few drops of sulfuric acid: a lemon yellow color is produced in the mixture, but on the addition of a drop of nitric acid, the color changes to greenish blue, rapidly becoming reddish and finally yellow, or almost colorless. Upon now adding an excess of sodium hydroxide T.S., the color is changed to red.

C: One drop of ferric chloride T.S., added to 1 cc. of an alcoholic solution of Colchicine (1 in 20), produces a garnet red color at once.

Loss on drying—When dried over sulfuric acid for 18 hours, Colchicine loses not more than 2 per cent of its weight.

Ash—The ash from 0.1 Gm. of Colchicine is negligible, page 556.

Chloroform—Heat a mixture of about 10 mg. of Colchicine, 2 cc. of sodium hydroxide T.S., and 1 drop of aniline: no odor of phenylisocyanide is developed.

Colchicine—The addition of 2 drops of ferric chloride T.S. to 5 cc. of an aqueous solution of Colchicine (1 in 100) produces no color. On heating the mixture, a brownish red color develops, which changes to brownish black.

Storage—Preserve Colchicine in tight, light-resistant containers.

U. S. P. Product of Colchicine—*Tabellæ Colchicinæ*.

AVERAGE DOSE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

COLLODIUM

Collodion

Collod.

Collodion contains not less than 5 per cent of pyroxylin.

PYROXYLIN.....	40 Gm.
ETHYL OXIDE.....	750 cc.
ALCOHOL.....	250 cc.
To make about.....	1000 cc.

Add the alcohol to the pyroxylin contained in a suitable bottle, shake the mixture thoroughly, add the ethyl oxide, and again shake the mixture until the pyroxylin is dissolved. Stopper the bottle well, and set it aside until the liquid becomes clear. Finally decant the clear portion from any sediment which may have deposited, and promptly transfer it to tight containers.

Description—Collodion is a clear, or slightly opalescent, syrupy liquid. It is colorless, or slightly yellowish, and has the odor of ether. *It is highly inflammable.*

Specific gravity—The specific gravity of Collodion is not less than 0.765 and not more than 0.775 at 25° C.

Identification—

A: When exposed to the air in a thin layer, Collodion leaves a transparent, tenacious film. The film of pyroxylin so obtained burns rapidly, with a yellow flame.

B: When mixed with an equal volume of distilled water, Collodion yields a viscid, stringy mass of pyroxylin.

Free acid—Add 5 cc. of Collodion to 5 cc. of distilled water: the aqueous liquid separated from the pyroxylin is not acid to litmus.

Assay—Pour quickly about 10 cc. of Collodion into a tared flask, stopper, weigh accurately, warm it on a water bath, and add 10 cc. of distilled water dropwise, with constant stirring. Evaporate the mixture on a water bath, and dry the residue to constant weight at 110° C.

Alcohol content—From 22 to 26 per cent, by volume, of C_2H_5OH .

Storage—Preserve Collodion in tight containers, at a temperature not above 30° C., remote from fire.

U. S. P. Product of Collodion—Collodium Flexile.

COLLODIUM FLEXILE

Flexible Collodion

Collod. Flex.

CAMPHOR.....	20 Gm.
CASTOR OIL.....	30 Gm.
COLLODION, a sufficient quantity,	
To make.....	1000 Gm.

Weigh the ingredients, successively, into a dry, tared bottle, stopper the bottle, and shake the mixture until the camphor is dissolved.

Alcohol content—From 21 to 25 per cent, by volume, of C_2H_5OH .

Storage—Preserve Flexible Collodion in tight containers, at a temperature not above $30^{\circ}C$., remote from fire.

CRESOL

Cresol

C_7H_8O

$CH_3.C_6H_4.OH$

Mol. wt. 108.13

Cresol is a mixture of isomeric cresols obtained from coal tar.

Description—Cresol is a colorless, or yellowish to brownish yellow, or pinkish, highly refractive liquid, becoming darker with age and on exposure to light. It has a phenol-like, sometimes empyreumatic odor.

Solubility—One cc. of Cresol dissolves in about 50 cc. of water, usually forming a cloudy solution. It is miscible with alcohol, with ether, and with glycerin, and is dissolved by solutions of the fixed alkali hydroxides.

Specific gravity—The specific gravity of Cresol is not less than 1.030 and not more than 1.038 at $25^{\circ}C$.

Distillation range—Not less than 90 per cent by volume of Cresol distills between 195° and $205^{\circ}C$., when determined by Method II under *Boiling or Distilling Temperatures*, page 559.

Identification—A saturated aqueous solution of Cresol becomes bluish violet on the addition of ferric chloride T.S.

Reaction—A saturated aqueous solution of Cresol is neutral or only slightly acid to litmus paper.

Hydrocarbons—A solution of 1 cc. of Cresol in 60 cc. of distilled water shows no more turbidity than that produced in 58 cc. of distilled water by the addition of 1.5 cc. of fiftieth-normal sulfuric acid and 1 cc. of barium chloride T.S., comparison being made after the control mixture has been well shaken and allowed to stand for 5 minutes.

Storage—Preserve Cresol in tight, light-resistant containers.

U. S. P. Product of Cresol—Liquor Cresolis Saponatus.

CRETA PRÆPARATA

Prepared Chalk

Cret. Præp.—Drop Chalk

Prepared Chalk is a native form of calcium carbonate freed from most of its impurities by elutriation, and containing, when dried to constant weight at $200^{\circ}C$., not less than 97 per cent of $CaCO_3$.

Description—Prepared Chalk is a white to grayish white, microcrystalline powder, often prepared in cones. It is odorless and tasteless, and is stable in air.

Solubility—Prepared Chalk is practically insoluble in water and is insoluble in alcohol.

Identification—Prepared Chalk responds to the *identification* tests under *Calcii Carbonas Præcipitatus*, page 95.

Acid-insoluble residue—Mix 1 Gm. of Prepared Chalk with 50 cc. of distilled water, add diluted hydrochloric acid, drop by drop, with agitation until it ceases to cause effervescence. Collect the insoluble residue on a filter, wash it with distilled water, ignite, and weigh: the weight of the residue does not exceed 20 mg.

Heavy metals—Mix 1 Gm. of Prepared Chalk with 5 cc. of distilled water, add slowly 8 cc. of diluted hydrochloric acid, and evaporate the mixture to dryness on a water bath. Dissolve the residue in 20 cc. of distilled water, and filter. Add distilled water to the filtrate to make 24 cc. and then add 1 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 586, for Prepared Chalk is 40 parts per million.

Assay—Proceed as directed under *Calcii Carbonas Præcipitatus*, page 95.

Storage—Preserve Prepared Chalk in well-closed containers.

U. S. P. Products of Prepared Chalk—Hydrargyrum cum Creta, Mistura Cretæ, Pulvis Cretæ Compositus.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

CUPRI SULFAS

Cupric Sulfate

Cupr. Sulf.—Copper Sulfate

$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Mol. wt. 249.71

Cupric Sulfate contains not less than 63 per cent and not more than 66.8 per cent of CuSO_4 , corresponding to not less than 98.5 per cent of the hydrated salt ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$).

Description—Cupric Sulfate occurs as deep blue, triclinic crystals, or as blue, crystalline granules or powder. It has a nauseous, metallic taste and effloresces slowly in dry air.

Solubility—One Gm. of Cupric Sulfate dissolves in 3 cc. of water, in about 500 cc. of alcohol, and very slowly in 3 cc. of glycerin, at 25° C. One Gm. dissolves in about 0.5 cc. of boiling water.

Identification—

A: An aqueous solution of Cupric Sulfate (1 in 20) has a blue color.

B: An aqueous solution of Cupric Sulfate (1 in 10) responds to the tests for copper, page 589, and for sulfate, page 592.

Reaction—An aqueous solution of Cupric Sulfate (1 in 20) is acid to litmus paper.

Alkali and alkaline earths—Dissolve 2 Gm. of Cupric Sulfate in 100 cc. of distilled water, add 1 cc. of diluted hydrochloric acid, and pass hydrogen sulfide through the solution until all of the copper is precipitated. Filter the mixture, evaporate 50 cc. of the filtrate to dryness, and ignite: the weight of the residue does not exceed 3 mg.

Assay—Weigh accurately about 1 Gm. of Cupric Sulfate, dissolve it in 50 cc. of distilled water, add 4 cc. of acetic acid and 3 Gm. of potassium iodide, and titrate

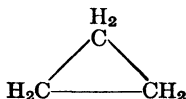
the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.01596 Gm. of CuSO_4 .

Storage—Preserve Cupric Sulfate in tight containers.

CYCLOPROPANUM

Cyclopropane

Cycloprop.—Trimethylene



C_3H_6

Mol. wt. 42.08

Cyclopropane contains not less than 99 per cent by volume of C_3H_6 .

The label must bear the following statement: "*Caution—Cyclopropane is inflammable and its mixture with oxygen or air may explode when brought in contact with a flame or other causes of ignition.*"

Description—Cyclopropane is a colorless gas of characteristic odor resembling that of petroleum benzin, and having a pungent taste. One liter of Cyclopropane at a pressure of 760 mm. and 0°C . weighs 1.879 Gm.

Solubility—One volume of Cyclopropane dissolves in about 2.7 volumes of water at 15°C . It is freely soluble in alcohol, and soluble in fixed oils.

Note—Cylinders containing Cyclopropane must be kept at a temperature between 20° and 30°C . for at least 6 hours before the Cyclopropane is withdrawn for the following determinations. Samples for the following tests and assays are to be measured at room temperature and corrected to a pressure of 760 mm. and a temperature of 25°C .

Acids or alkalies—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling distilled water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of 3 color-comparator tubes of clear glass, of approximately the same size and marked "A," "B," and "C," respectively. To tube "B" add 0.2 cc. of hundredth-normal hydrochloric acid and to tube "C" add 0.4 cc. of hundredth-normal hydrochloric acid. Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Cyclopropane through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Cyclopropane through 50 cc. of barium hydroxide T.S. The test solution must be devoid of turbidity prior to the test. Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of the gas. The delivery tube must have an orifice approximately 1 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the barium hydroxide solution. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with the 50 cc. of solution. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution, prepared by dissolving 0.1 Gm. of sodium bicarbonate in 100 cc. of freshly boiled and cooled distilled water, is added to another 50-cc. portion of barium hydroxide T.S. under the prescribed conditions.

Halogens—Provide a 500-cc. flask with a tightly-fitting two-hole rubber stopper. Through one of the holes pass a delivery tube bent at right angles and extending just beyond the lower surface of the stopper. Through the other opening insert a capillary tube bent at right angles and with a bore of 1 mm. $\pm$ 0.2 mm., in the same manner. Place in a 50-cc. cylinder, having an internal diameter of 2 cm.

≈ 0.25 cm., 40 cc. of sodium carbonate solution, containing 1 Gm. of monohydrated sodium carbonate in 1000 cc. of distilled water. Provide the cylinder with a two-hole rubber stopper, and through one hole pass a right angle delivery tube, with a bore of 3 mm. ≈ 0.5 mm., to within 2 mm. of the bottom of the cylinder. The end of the delivery tube which extends out of the cylinder is provided with an enlargement 8 cm. ≈ 0.5 cm. long and with an internal diameter of 2 cm. ≈ 0.25 cm. Through the other opening in the stopper pass another right-angle delivery tube, having it extend just below the surface of the stopper. Collect 500 cc. of Cyclopropane in the flask. By means of hydrostatic pressure, applied through the delivery tube, force the gas through the capillary tube, the distilled water used being previously saturated with Cyclopropane. Ignite the gas, place the enlarged end of the delivery tube, connected with the cylinder, around the flame, extending the flame one-third of the way into the enlargement. Apply suction to the shorter delivery tube connected with the cylinder, thus drawing the spent gases through the sodium carbonate solution, the period of ignition of the 500 cc. of Cyclopropane requiring approximately 30 minutes. If the air employed for the ignition is not halogen-free, a correction must be made for the amount of halogen in the volume of air used for the ignition of the gas. Drain the sodium carbonate solution into a 500-cc. volumetric flask, and rinse the cylinder thoroughly, collecting the washings in the flask. Dilute the solution to volume, and mix thoroughly. Add sufficient nitric acid to 50 cc. of the solution to make it acid to litmus paper. and then add 1 cc. of acid in excess. Prepare a blank containing 0.5 cc. of thousandth-normal hydrochloric acid and 4 cc. of the sodium carbonate solution in 46 cc. of distilled water, acidify with nitric acid, and then add 1 cc. of acid in excess. Add 1 cc. of silver nitrate T.S. to each solution. After 5 minutes any opalescence in the solution representing the Cyclopropane should not exceed that in the blank.

Propylene, allene and other unsaturated hydrocarbons—Pass 1000 cc. of Cyclopropane through exactly 50 cc. of hundredth-normal potassium permanganate contained in a 50-cc. cylinder and maintained at $3^{\circ}\text{C.} \approx 2^{\circ}\text{C.}$ Regulate the flow so as to require 15 minutes for the delivery of the gas. The delivery tube must have an orifice 1 mm. ≈ 0.2 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the potassium permanganate solution. The vessel employed must give a hydrostatic column of 12 to 14 cm. with 50 cc. of the solution. Immediately transfer the potassium permanganate solution in several portions to an Erlenmeyer flask of about 300-cc. capacity, containing a mixture of exactly 50 cc. of hundredth-normal oxalic acid and 5 cc. of sulfuric acid previously heated to 90°C. After all of the potassium permanganate solution has been added, titrate the mixture with hundredth-normal potassium permanganate to a faint pink color which persists for 30 seconds. The volume of hundredth-normal potassium permanganate reduced by the gas does not exceed 10 cc.

Carbon monoxide—Transfer 250 cc. of Cyclopropane to a suitable container, and add, avoiding the admixture of air as much as possible, 2.5 cc. of diluted blood, prepared by adding 0.5 cc. of blood, page 660, to 10 cc. of distilled water. Into a similar container pass 250 cc. of carbon monoxide-free air, page 561, and add 2.5 cc. of the diluted blood. Stopper the containers securely, and agitate them for 15 minutes. Transfer the blood to two small test tubes, add to each 40 mg. of a mixture of equal weights of pyrogallol and tannic acid, shake thoroughly, and allow to stand in the dark for 15 minutes. Upon observation the tube containing the blood exposed to the Cyclopropane shows no pink coloration and matches the gray color produced in the blank test.

Assay—Withdraw 100 cc. of Cyclopropane, accurately measured in a gas burette previously filled with mercury and equipped with a leveling bulb at the lower end, from a cylinder in the upright position. Connect one arm of the stopcock to a Hempel pipette which has been previously filled with sulfuric acid. Transfer the gas completely to the Hempel pipette, through proper manipulation of the stopcock and the leveling bulb, transfer any residual gas in the pipette to the burette, and read its volume accurately. Again transfer the residual gas to the Hempel pipette and return it a second time to the burette for measurement. Repeat this procedure until a constant volume is obtained. Not more than 1 cc. of gas remains.

Storage—Preserve Cyclopropane in tight containers.

DECOCTA

Decoctions

A decoction may be dispensed only if it has been recently prepared. If the drug concentration of a decoction is not otherwise specified, it is to be prepared according to the following general formula:

THE DRUG, coarsely comminuted.....	50 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

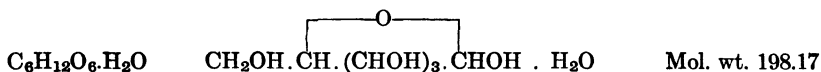
Place the drug in a suitable vessel provided with a cover, pour upon it 1000 cc. of cold distilled water, cover it well, and boil the mixture for 15 minutes. Then allow it to cool to about 40° C., express, strain the expressed liquid, and pass enough cold distilled water through the strainer to make the product measure 1000 cc.

Caution—The drug concentration of a decoction representing a potent drug should be specified by the physician.

DEXTROSUM

Dextrose

Dextros.—*D*-Glucose



Dextrose is a sugar usually obtained by the hydrolysis of starch.

Note—In preparing Dextrose Injections it is permissible to use a dextrose which does not conform to the official requirements for water of hydration, provided the product meets all other official requirements for purity and also provided suitable allowance is made for the difference in water content. If such a solution is labeled with respect to its dextrose content, the label should indicate the number of Gm. of U. S. P. (hydrous) Dextrose contained in each 100 cc.

Description—Dextrose occurs as colorless crystals or as a white crystalline or granular powder. It is odorless, and has a sweet taste.

Solubility—One Gm. of Dextrose dissolves in about 1 cc. of water and in about 60 cc. of alcohol at 25° C. It is more soluble in boiling water and in boiling alcohol.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Dextrose, determined in an aqueous solution containing, in each 100 cc., 10 Gm. of Dextrose, previously dried to constant weight at 100° C., and 0.2 cc. of ammonia T.S., and in a 200-mm. tube, is not less than +52.5° and not more than +53°.

Identification—Add a few drops of an aqueous solution of Dextrose (1 in 20) to 5 cc. of hot alkaline cupric tartrate T.S.: a copious red precipitate of cuprous oxide appears.

Color of aqueous solution—Dissolve 25 Gm. of Dextrose in sufficient distilled water to make exactly 50 cc. of solution: the solution has no more color than a mixture of 47 cc. of distilled water with 3 cc. of a solution prepared by mixing 1.0 cc. of

cobaltous chloride C.S., 3.0 cc. of ferric chloride C.S. and 2.0 cc. of cupric sulfate C.S. with sufficient distilled water to make 10 cc. The comparison must be made by viewing the solutions downward in matched Nessler tubes, against a white surface.

Loss on drying—When dried to constant weight at 100° C., Dextrose loses not less than 8 per cent and not more than 10 per cent of its weight.

Ash—Dextrose yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Dextrose (1 in 20) is neutral to litmus paper.

Chloride—A 2-Gm. portion of Dextrose shows no more *chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 2-Gm. portion of Dextrose shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—Dissolve 1.5 Gm. of Dextrose in 5 cc. of distilled water, add 5 cc. of diluted sulfuric acid and 1 cc. of bromine T.S., and heat for 5 minutes on a water bath. Add 0.5 Gm. of potassium iodide, follow with 5 drops of stannous chloride T.S., cool, and test for arsenic, page 554. The stain produced, if any, is not more intense than that produced in a similar test made with the same quantities of the reagents and 2 cc. of the standard arsenic solution.

Heavy metals—Thoroughly char 5 Gm. of Dextrose in a porcelain dish, cool, add a mixture of 30 cc. of diluted hydrochloric acid and 3 cc. of bromine T.S., cover the dish and boil gently for 10 minutes. Filter and wash the filter and residue with 25 cc. of hot distilled water. Evaporate the filtrate to a volume of about 15 cc., cool and add ammonia T.S., dropwise, until the solution is neutral to litmus paper, then add 2 cc. of diluted acetic acid and dilute to 25 cc. with distilled water. The heavy metals limit, page 586, for Dextrose is 5 parts per million. Perform a blank determination with the same quantities of reagents and in the same manner and make any necessary correction.

Dextrin—Boil 1 Gm. of finely powdered Dextrose with 15 cc. of alcohol under a reflux condenser: it dissolves completely.

Soluble starch, sulfites—To a solution of 1 Gm. of Dextrose in 10 cc. of distilled water add 1 drop of iodine T.S.: the liquid is colored yellow.

Storage—Preserve Dextrose in well-closed containers.

U. S. P. Products of Dextrose—Injectio Dextrosi, Injectio Dextrosi et Sodii Chloridi.

DIGITALIS

Digitalis

Digit.—Foxglove, *Digitalis folium* P.I.

Digitalis is the dried leaf of *Digitalis purpurea* Linné (Fam. *Scrophulariaceæ*).

The potency of Digitalis shall be such that, when assayed as directed, 0.1 Gm. shall be equivalent to not less than 1.0 U. S. P. Digitalis Unit. One *United States Pharmacopœial Digitalis Unit* represents the potency of 0.1 Gm. of the U. S. P. Digitalis Reference Standard, page 607.

Digitalis contains not more than 6 per cent of moisture, not more than 2 per cent of stems, browned leaves, flowers, or foreign organic matter, and yields not more than 5 per cent of acid-insoluble ash, page 629.

Note—When *Digitalis* is prescribed, *Digitalis Pulverata* is to be dispensed.

Description—

Unground Digitalis—More or less crumpled or broken; blades ovate-lanceolate, mostly 10 to 35 cm. in length and 4 to 11 cm. in width and contracted into a winged petiole; margin crenate or irregular; the lower surface densely pubescent, upper surface wrinkled, finely hairy; venation conspicuously reticulate, the mid-rib and principal veins broad and flat and the lower veins continued into the wings of the petiole; color of the upper surface dark green, of lower surface grayish from the dense pubescence, the larger veins often purplish; odor slight when dry, peculiar and characteristic when moistened; taste very bitter.

Histology—Upper epidermis with slightly wavy vertical walls, numerous hairs and no stomata; lower epidermis with wavy vertical walls, numerous oval stomata and many hairs, and frequently not attached over irregular areas, to the cell layer within, especially near the veins; chlorenchyma of a single layer of short palisade cells and several layers of spongy parenchyma; vascular bundles of larger veins and petiole, numerous, separated by medullary rays 1 cell wide.

Ground Digitalis—Dark green; numerous irregular fragments of epidermis; non-glandular hairs frequently curved or crooked, up to 500 microns in length, uniseriate, 2 to 8 cells, some of the cells collapsed so that the planes of adjoining cells may be at right angles, the terminal cell pointed or occasionally rounded; glandular hairs few, small, usually with a 1- or 2-celled stalk and a 1- or 2-celled head; fragments of veins and petioles with tracheæ annular, reticulate or spiral or with simple pores; calcium oxalate absent.

Assay—Weigh accurately at least 5 Gm. of *Digitalis*, in fine powder, in a weighing bottle, and proceed as directed under the *Assay* under *Tinctura Digitalis*, page 510, in the first paragraph, line 3, beginning with the words “transfer to a dry, hard-glass, glass-stoppered container . . .”

Storage—Preserve *Digitalis* under all conditions of storage and transportation in water-proof and air-tight containers. A suitable cartridge or device, containing a non-liquefying, inert, dehydrating substance may be used in the container to maintain low humidity.

U. S. P. Products of *Digitalis*—*Capsulæ Digitalis*, *Digitalis Pulverata*, *Injectio Digitalis*, *Tabellæ Digitalis*, *Tinctura Digitalis*.

DIGITALIS PULVERATA

Powdered *Digitalis*

Digit. Pulverat.

Digitalis, dried at a temperature not exceeding 60° C. and reduced to a fine powder. Powdered *Digitalis* contains not more than 5 per cent of moisture.

The potency of Powdered *Digitalis* shall be such that, when assayed as directed, 0.1 Gm. shall be equivalent to 1.0 U. S. P. *Digitalis* Unit, page 150.

Note: When Digitalis is prescribed, Digitalis Pulverata is to be dispensed. The attention of physicians is called to the fact that U. S. P. XII Powdered Digitalis is materially reduced in potency when compared with the U. S. P. XI Powder.

Description and physical properties—It conforms to the description for *Ground Digitalis* under *Digitalis*, page 151.

Assay—Proceed as directed under *Digitalis*, page 151. If necessary, adjust the finished product to conform to the official potency by admixture with a sufficient

quantity of the exhausted marc of digitalis or with a ground digitalis having either a lower or a higher potency as may be required. After the adjustment repeat the assay to insure compliance with the required potency.

Storage—Preserve Powdered Digitalis in water-proof, air-tight, light-resistant containers. A suitable cartridge or device, containing a non-liquefying, inert, dehydrating substance may be used in the container to maintain low humidity.

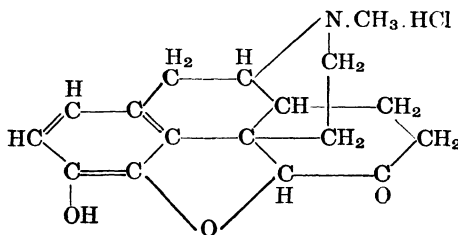
U. S. P. Products of Digitalis—See Digitalis, page 151.

AVERAGE DOSE—Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

DIHYDROMORPHINONI HYDROCHLORIDUM

Dihydromorphinone Hydrochloride

Dihydromorph. Hydrochlor.



$C_{17}H_{19}O_3N.HCl$

Mol. wt. 321.80

Description—Dihydromorphinone Hydrochloride occurs as a fine, white, odorless, crystalline powder. It is affected by light.

Solubility—One Gm. of Dihydromorphinone Hydrochloride dissolves in about 3 cc. of water at 25° C. It is sparingly soluble in alcohol, and nearly insoluble in ether.

Identification—

- A: Dissolve about 0.5 Gm. of Dihydromorphinone Hydrochloride in 25 cc. of distilled water, add enough ammonia T.S. to render the mixture distinctly alkaline, and allow it to stand over night. Collect the precipitate on a filter, wash it with 50 cc. of cold distilled water, remove the water by suction, and dry for 4 hours at 100° C. The precipitate of dihydromorphinone melts with decomposition at about 260° C., the bath having been preheated to 240° C., page 595.
- B: The filtrate obtained in *Identification test A*, when acidified with diluted nitric acid, responds to the identity tests for chloride, page 589.
- C: Dissolve 0.5 Gm. of Dihydromorphinone Hydrochloride in 2 cc. of distilled water, and add it to a solution of 1 Gm. of hydroxylamine hydrochloride in 5 cc. of distilled water. Warm the mixture to about 80° C., add an excess of ammonia T.S., and allow to stand over night. Collect the precipitate of dihydromorphinone oxime on a filter, wash with 50 cc. of a mixture of 1 volume of ammonia T.S. and 99 volumes of distilled water, remove the excess water by suction, and dry for 4 hours at 100° C.: the precipitate melts with decomposition between 230° and 235° C.
- D: Dissolve 10 mg. of Dihydromorphinone Hydrochloride in 1 cc. of distilled water, and add a mixture of 5 cc. of potassium ferricyanide T.S. and 5 drops of ferric chloride T.S.: a deep blue color is produced at once.

Loss on drying—When dried at 100° C. for 6 hours, Dihydromorphinone Hydrochloride loses not more than 1.5 per cent of its weight.

Ash—The ash from 0.2 Gm. of Dihydromorphinone Hydrochloride is negligible, page 556.

Sulfate—To 5 cc. of an aqueous solution of Dihydromorphinone Hydrochloride (1 in 30) add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity is produced.

Ammonium salts—To 0.1 Gm. of Dihydromorphinone Hydrochloride add 5 cc. of sodium hydroxide T.S., and heat the mixture to boiling: no odor of ammonia is evolved.

Codeine—Dissolve 20 mg. of Dihydromorphinone Hydrochloride in 5 cc. of sulfuric acid, and add 1 drop of ferric chloride T.S.: no blue color results.

Acidity—Dissolve 0.3 Gm. of Dihydromorphinone Hydrochloride in 10 cc. of distilled water, and titrate the solution with fiftieth-normal sodium hydroxide, using 1 drop of methyl red T.S. as the indicator: not more than 0.3 cc. of the fiftieth-normal sodium hydroxide is required to produce a yellow color.

Storage—Preserve Dihydromorphinone Hydrochloride in tight, light-resistant containers.

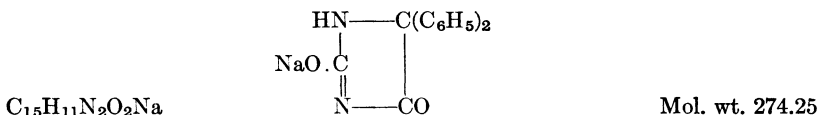
U. S. P. Product of Dihydromorphinone Hydrochloride—Tabellæ Dihydromorphinoni Hydrochloridi.

AVERAGE DOSE—Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain.

DIPHENYLHYDANTOINUM SODICUM

Diphenylhydantoin Sodium

Diphenylhydant. Sod.



Diphenylhydantoin Sodium, when dried for 4 hours at $100^\circ \text{C}.$, contains not less than 90.5 per cent and not more than 92 per cent of diphenylhydantoin ($\text{C}_{15}\text{H}_{12}\text{N}_2\text{O}_2$).

Description—Diphenylhydantoin Sodium occurs as a white, odorless powder. It is somewhat hygroscopic and on exposure to air gradually absorbs carbon dioxide with the liberation of diphenylhydantoin.

Solubility—Diphenylhydantoin Sodium is freely soluble in water, the aqueous solution usually being somewhat turbid due to partial hydrolysis. It is soluble in alcohol, but practically insoluble in ether and in chloroform.

Identification—

A: The residue obtained on ignition of about 0.25 Gm. of Diphenylhydantoin Sodium effervesces with acids, and responds to the test for sodium, page 592.

B: Dissolve about 0.5 Gm. of Diphenylhydantoin Sodium in 10 cc. of distilled water, and add 5 cc. of diluted hydrochloric acid. A white precipitate of diphenylhydantoin is formed. Collect the precipitate on a filter, wash it well with cold distilled water, and dry for 6 hours at $100^\circ \text{C}.$ The diphenylhydantoin so obtained melts between 292° and $299^\circ \text{C}.$ with some decomposition, the bath having been preheated to $270^\circ \text{C}.$, page 595.

Reaction—An aqueous solution of Diphenylhydantoin Sodium is alkaline to indicators.

Loss on drying—When dried for 4 hours at 100° C., Diphenylhydantoin Sodium loses not more than 2.5 per cent of its weight.

Clarity and color of solution—Dissolve 1 Gm. of Diphenylhydantoin Sodium in 20 cc. of recently boiled and cooled distilled water, and add tenth-normal sodium hydroxide until the hydrolyzed diphenylhydantoin is dissolved: it requires not more than 4 cc. of the tenth-normal sodium hydroxide to produce a clear solution, and the solution is colorless.

Chloride—Dissolve 0.2 Gm. of Diphenylhydantoin Sodium in 50 cc. of distilled water, add 2 cc. of diluted nitric acid, and filter. A 25-cc. portion of the filtrate shows no more *chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Dissolve 0.2 Gm. of Diphenylhydantoin Sodium in 50 cc. of distilled water, add 2 cc. of diluted hydrochloric acid, and filter. A 25-cc. portion of the filtrate shows no more *sulfate* than corresponds to 0.25 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Dissolve 0.5 Gm. of Diphenylhydantoin Sodium in 20 cc. of distilled water, add 1 cc. of sodium hydroxide T.S., dilute with distilled water to 25 cc., and add 5 drops of sodium sulfide T.S. If a dark color is produced, it is not darker than that in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 586, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 0.3 Gm. of Diphenylhydantoin Sodium, previously dried for 4 hours at 100° C., and transfer to a separator. Add 50 cc. of distilled water and 10 cc. of diluted hydrochloric acid, and extract with 100 cc. of absolute ether, then with four successive portions of 25 cc. each of absolute ether. Evaporate the combined ether extracts, and dry the residue of diphenylhydantoin to constant weight at 100° C.

Storage—Preserve Diphenylhydantoin Sodium in tight containers.

U. S. P. Product of Diphenylhydantoin Sodium—Capsulæ Diphenylhydantoini Sodici.

AVERAGE DOSE—Metric, 0.1 Gm.—Apothecaries, 1½ grains.

ELIXIR AROMATICUM

Aromatic Elixir

Elix. Arom.—Simple Elixir

COMPOUND SPIRIT OF ORANGE.....	12 cc.
SYRUP.....	375 cc.
PURIFIED TALC.....	30 Gm.
ALCOHOL,	
DISTILLED WATER, each, a sufficient quantity,	
To make.....	1000 cc.

To the compound spirit of orange add enough alcohol to make 250 cc. To this solution add the syrup in several portions, agitating vigorously after each addition, and afterwards add, in the same manner, a sufficient quantity of distilled water to make the product measure 1000 cc. Mix

the purified talc intimately with the liquid, and filter through a wetted filter, returning the first portions of the filtrate until a clear liquid is obtained.

Alcohol content—From 22 to 24 per cent, by volume, of C_2H_5OH .

Storage—Preserve Aromatic Elixir in tight containers.

ELIXIR PHENOBARBITALI

Elixir of Phenobarbital

Elix. Phenobarb.

Elixir of Phenobarbital contains, in each 100 cc., not less than 0.37 Gm. and not more than 0.43 Gm. of phenobarbital.

PHENOBARBITAL.....	4 Gm.
TINCTURE OF SWEET ORANGE PEEL.....	30 cc.
SOLUTION OF AMARANTH.....	10 cc.
ALCOHOL.....	125 cc.
GLYCERIN.....	450 cc.
SYRUP.....	150 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the phenobarbital in the alcohol, add the tincture of sweet orange peel, the glycerin, the syrup, the solution of amaranth, and sufficient distilled water to make the product measure 1000 cc. Mix well and filter, if necessary, to produce a clear Elixir.

Assay—Transfer exactly 25 cc. of Elixir of Phenobarbital to a separator, acidify with diluted hydrochloric acid, and saturate with sodium chloride. Add 30 cc. of chloroform, and shake the mixture gently for about 30 seconds. When the liquids have separated, draw off the chloroform layer into a second separator, and completely extract the phenobarbital with successive 25-cc. portions of chloroform, combining the chloroform extracts in the second separator. Shake the combined chloroform extracts with 10 cc. of distilled water, and draw off the chloroform through a pledget of purified cotton into a tared beaker. Wash the aqueous layer with 10 cc. of chloroform, and draw this off through the cotton filter into the tared beaker. Evaporate the chloroform solution to dryness, and dry the residue at $100^{\circ} C$. to constant weight. The weight of the residue is the weight of phenobarbital in the portion of Elixir taken for assay.

Alcohol content—From 12 to 15 per cent, by volume, of C_2H_5OH .

Storage—Preserve Elixir of Phenobarbital in tight, light-resistant containers.

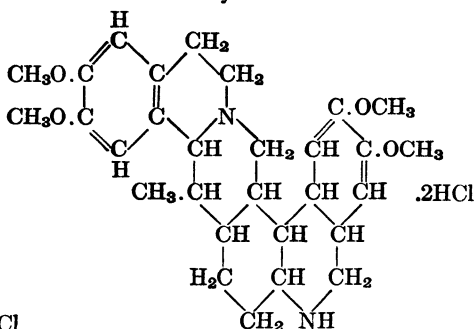
AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

One average dose contains 16 mg. ($\frac{1}{4}$ grain) of phenobarbital.

EMETINÆ HYDROCHLORIDUM

Emetine Hydrochloride

Emet. Hydrochlor.

 $C_{29}H_{40}N_2O_4 \cdot 2HCl$

Mol wt. 553.56

Emetine Hydrochloride is a hydrated hydrochloride of an alkaloid obtained from ipecac or prepared synthetically by methylation of cephaeline.

Description—Emetine Hydrochloride is a white or very slightly yellowish, odorless, crystalline powder. It is affected by light.

Solubility—Emetine Hydrochloride is freely soluble in water and in alcohol.

Identification—

A: Aqueous solutions of Emetine Hydrochloride (1 in 100) yield precipitates with iodine T.S., with mercuric potassium iodide T.S., and with platinic chloride T.S.

B: Sulfuric acid, containing in each cc. about 5 mg. of molybdic acid, produces a bright green mixture with Emetine Hydrochloride.

C: Silver nitrate T.S. produces in an aqueous solution of Emetine Hydrochloride (1 in 20) a white precipitate insoluble in nitric acid.

Loss on drying—When dried to constant weight at $100^{\circ}C$, Emetine Hydrochloride loses not less than 8 per cent and not more than 14 per cent of its weight.

Ash—The ash from 0.2 Gm. of Emetine Hydrochloride is negligible, page 556.

Carbonizable substances—Dissolve 0.1 Gm. of Emetine Hydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid H, page 563.

Free acid—A solution of 0.1 Gm. of Emetine Hydrochloride in 10 cc. of distilled water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Cephaeline—Dissolve 0.2 Gm. of Emetine Hydrochloride in 10 cc. of distilled water, and add 5 cc. of sodium hydroxide T.S. Extract the mixture successively with 20 cc. of ether and then with 10-cc. portions of ether, until the residue obtained by evaporating 2 cc. of the last ether extraction, dissolved in 1 drop of diluted hydrochloric acid and 1 cc. of distilled water, does not yield a distinct turbidity with iodine T.S. Discard the ether solutions, acidulate the aqueous liquid with diluted sulfuric acid, then add ammonia T.S. until the mixture is alkaline, and extract with four successive 10-cc. portions of ether. Evaporate the combined ether solutions to dryness on a water bath, and dry the residue at $100^{\circ}C$. for 1 hour: the weight of the residue does not exceed 4 mg.

Storage—Preserve Emetine Hydrochloride in tight, light-resistant containers.

U. S. P. Product of Emetine Hydrochloride—Injectio Emetinæ Hydrochloridi.

AVERAGE DOSE—Daily, intramuscular, Metric, 60 mg.—

Apothecaries, 1 grain.

EMPLASTRUM ADHÆSIVUM

Adhesive Plaster

Emp. Adhæs.—Adhesive Tape

Description—Adhesive Plaster consists of a mixture, having pressure-sensitive adhesive properties, spread evenly upon fabric the back of which may be coated with a water-repellent film. The plaster mass must be free from lumps. The plaster must have a tensile strength, determined warpwise, of not less than 20.41 Kg. (45 pounds) per 2.55 cm. (1 inch) of width.

Dimensions—The actual length of Adhesive Plaster is not less than 98 per cent of the labeled length of the Plaster. Measure the width of the Plaster at 5 points evenly spread along the center line of the Plaster: the average of 5 measurements is not more than 1.6 mm. ($\frac{1}{16}$ inch) less than the labeled width of the Plaster.

Tensile strength—Determine the tensile strength of Adhesive Plaster, unrolled and conditioned for at least 4 hours in a standard atmosphere of 65 per cent, ± 2 per cent relative humidity, at 21° C., $\pm 1.1^\circ$ C. (70° F., $\pm 2^\circ$ F.), with a pendulum-type testing machine, as described under *Tensile Strength Determination*, page 621, converting the values actually obtained to Kg. (pounds) per 2.54 cm. (1 inch) of width.

Adhesive strength—Cut a strip of Adhesive Plaster 2.54 cm. (1 inch) wide and approximately 15 cm. (6 inches) long, and apply 12.90 sq. cm., 2.54 cm. by 5.08 cm. (2 square inches, 1 by 2 inches) of one end of the strip to a clean bakelite surface by means of a rubber roller under a pressure of 850 Gm., passing the roller twice over the Plaster at a rate of 30 cm. (12 inches) per minute. The temperature of the bakelite surface and the Plaster shall be adjusted to 37° C. and the test conducted immediately thereafter as directed under *Tensile Strength Determination*, page 621, using a pendulum-type testing machine, the pull being exerted parallel with the warp and the bakelite: the average of not less than 10 tests shall be not less than 17 Kg. (40 pounds).

Storage—Preserve Adhesive Plaster preferably at a temperature not above 30° C. and do not expose to sunlight.

EMPLASTRUM ADHÆSIVUM STERILE

Sterile Adhesive Plaster

Emp. Adhæs. Steril.—Sterile Adhesive Tape

Description—Sterile Adhesive Plaster consists of a mixture, having pressure-sensitive properties, spread evenly upon fabric the back of which may be coated with a water-repellent film. The plaster mass must be free from lumps.

The adhesive surface must be protected by strips of Holland cloth or other protective material of not less than the width of the Plaster.

Sterile Adhesive Plaster must be protected from contamination by suitable packaging and must be sterilized after packaging.

Sterility—Sterile Adhesive Plaster meets the requirements of the *Sterility Tests for Solids*, page 610.

Other requirements—Sterile Adhesive Plaster meets the requirements for *width and length* under *Ligamentum Carbasii Absorbens*, page 254, and the requirements for *tensile strength and adhesive strength* under *Emplastrum Adhæsivum*, page 157.

Storage—Each Sterile Adhesive Plaster unit shall be so packaged individually that the sterility of the unit is maintained until the package is opened for use. Each Sterile Adhesive Plaster unit shall be sterilized in the package, and the package shall

bear a statement to the effect that the sterility of the Plaster cannot be guaranteed if the package bears evidence of damage or has been previously opened. The length and width of the plaster shall be stated upon the package.

Preserve Sterile Adhesive Plaster preferably at a temperature not above 30° C. and do not expose to sunlight.

EMPLASTRUM BELLADONNÆ

Belladonna Plaster

Emp. Bellad.

Belladonna Plaster is a mixture of adhesive plaster mass and an extract prepared from belladonna root, spread evenly upon fine cotton cloth or other suitable backing material. The plaster mass yields not less than 0.25 per cent and not more than 0.30 per cent of the alkaloids of belladonna root.

Each 100 square centimeters of the spread plaster contains at least 2.5 Gm. of the belladonna plaster mass.

Assay—Measure accurately the area of a piece of Belladonna Plaster, equivalent to about 10 Gm., then weigh it accurately. Cut the weighed plaster into small strips and place them in a 150-cc. flask. Add 50 cc. of chloroform, and shake the mixture until the plaster mass is disintegrated. Pour the chloroform solution into a 250-cc. beaker, and wash the cloth upon which the plaster was spread with two successive portions of 25 cc. each of chloroform, adding the washings to the chloroform solution. Then wash the cloth with 50 cc. of alcohol containing 1 cc. of ammonia T.S., and add the washing to the chloroform solution. Again wash the cloth with 40 cc. of alcohol, and add the washing to the chloroform solution in the beaker. Stir the mixture gently but thoroughly, and allow it to stand until any coagulum has separated into a compact mass. Dry the cloth upon which the plaster was spread, weigh it, and subtract its weight from the first weight of the spread plaster. The difference represents the weight of the plaster mass. From the weight thus found calculate the weight of plaster mass per 100 square centimeters of the spread plaster. Filter the chloroform-alcohol solution into a separator through a small pledget of purified cotton, knead the coagulum, if any, with a glass rod to force out the retained chloroform-alcohol solution, and rinse the coagulum and the beaker with 10 cc. of alcohol. Pour the rinsing through the cotton pledget into the separator, and force the solution retained by the cotton into the separator by pressure with a glass rod. Completely remove the alkaloids from the chloroform-alcohol solution by repeated extraction with approximately half-normal sulfuric acid. (See *Purification of Alkaloids*, page 604, under *Proximate Assays*.) Complete the assay as directed under *Hyoscyamus*, page 218, beginning with the words, "Render the combined acid solutions distinctly alkaline with ammonia T.S." Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of belladonna root.

Storage—Preserve Belladonna Plaster in well-closed containers at a temperature which does not exceed 30° C. Protect it from direct sunlight.

EMPLASTRUM SINAPIS

Mustard Plaster

Emp. Sinap.—Mustard Paper

Mustard Plaster is a uniform mixture of powdered black mustard, deprived of its fixed oil, and a solution of a suitable adhesive, spread on paper, cotton cloth, or other suitable backing material.

Each 100 square centimeters of spread plaster contains not less than 2.5 Gm. of black mustard deprived of its fixed oil.

When moistened thoroughly with tepid water and applied to the skin, the Plaster produces a decided warmth and reddening of the skin within 5 minutes.

Storage—Preserve Mustard Plaster in well-closed containers, preferably at a temperature not above 35° C. Protect it from direct sunlight.

Note—Before it is applied, Mustard Plaster should be thoroughly moistened with tepid water.

EMULSA

Emulsions

In preparing U. S. P. emulsions, methods of emulsification other than those described in the several monographs may be used and the quantity of acacia may be reduced, or it may be replaced with gelatin,* tragacanth, agar, or mixtures of any of these emulsifying agents.

The methyl salicylate in Emulsion of Cod Liver Oil and the vanillin in Emulsion of Liquid Petrolatum may be replaced by not more than 1 per cent of any other flavoring substance or any mixture of flavoring substances recognized in this Pharmacopœia. If a preservative is needed, 60 cc. of alcohol may be used in Emulsion of Cod Liver Oil, replacing a like quantity of the distilled water, or, instead of the alcohol,

* Gelatin meeting U. S. P. specifications but particularly designed for the preparation of emulsions is available in two types based upon their method of manufacture. One type, known as "Pharmagel A," is prepared from acid-treated precursors and is used without other emulsifying agents and at a pH of about 3.2. A second type of gelatin, known as "Pharmagel B," is prepared from alkali-treated precursors and is used at a pH of about 8.0. Pharmagel B may be used alone or in combination with other emulsifying agents. The 125 Gm. of acacia in Emulsion of Cod Liver Oil and in Emulsion of Liquid Petrolatum may be replaced by a mixture of 8 Gm. of Pharmagel A and 0.6 Gm. of tartaric acid. If a mixture of gelatin and tragacanth or gelatin and agar is used in an emulsion, to provide greater viscosity, a mixture of 5 Gm. of Pharmagel B and 2.5 Gm. of sodium bicarbonate should be used, adding sufficient tragacanth or agar to provide the desired viscosity.

in either Emulsion of Cod Liver Oil or Emulsion of Liquid Petrolatum 60 cc. of tincture of sweet orange peel or 2 Gm. of benzoic acid may be used.

EMULSUM OLEI MORRHUÆ

Emulsion of Cod Liver Oil

Emuls. Ol. Morrh.

COD LIVER OIL.....	500 cc.
ACACIA, in very fine powder.....	125 Gm.
SYRUP.....	100 cc.
METHYL SALICYLATE.....	4 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Quickly and thoroughly mix the acacia with the cod liver oil in a dry mortar or other suitable vessel, then add at once 250 cc. of distilled water, and complete the emulsification by trituration or by the aid of a suitable mechanical device. When a thick, white, homogeneous emulsion is obtained, add the methyl salicylate and the syrup in small, divided portions, triturating thoroughly after each addition, and in the same manner add sufficient distilled water to make the product measure 1000 cc., and mix thoroughly.

For permissible modifications, see *Emulsa*, page 159.

AVERAGE DAILY DOSE—Infants and adults,
 Metric Apothecaries
 15 cc.—4 fluidrachms.

Note—*Emulsion of Cod Liver Oil prepared from Oil containing more than the minimum U. S. P. requirements for both Vitamin A and Vitamin D may be administered in proportionally smaller doses.*

EMULSUM OLEI TEREBINTHINÆ

Emulsion of Oil of Turpentine

Emuls. Ol. Tereb.

RECTIFIED OIL OF TURPENTINE.....	15 cc.
ACACIA, in very fine powder.....	5 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	100 cc.

Place the powdered acacia in a dry bottle, add the oil of turpentine, mix thoroughly, add exactly 10 cc. of distilled water, stopper, and agitate

briskly until an emulsion forms. Then gradually add sufficient distilled water to make the product measure 100 cc., and mix thoroughly.

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

EMULSUM PETROLATI LIQUIDI

Emulsion of Liquid Petrolatum

Emuls. Petrolat. Liq.—Mineral Oil Emulsion

LIQUID PETROLATUM.....	500 cc.
ACACIA, in very fine powder.....	125 Gm.
SYRUP.....	100 cc.
VANILLIN.....	40 mg.
ALCOHOL.....	60 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the liquid petrolatum with the powdered acacia in a dry mortar, add 250 cc. of distilled water all at once, and emulsify the mixture. Then add, in divided portions and triturating after each addition, a mixture of the syrup, 50 cc. of distilled water and the vanillin dissolved in the alcohol. Finally add sufficient distilled water to make the product measure 1000 cc.

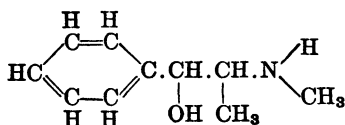
For permissible modifications, see *Emulsa*, page 159.

AVERAGE DOSE—Metric, 30 cc.—Apothecaries, 1 fluidounce.

EPHEDRINA

Ephedrine

Ephedrin.



$\text{C}_{10}\text{H}_{15}\text{NO}$

Mol. wt. 165.23

Ephedrine is an alkaloid obtained from *Ephedra equisetina* Bunge, *Ephedra sinica* Stapf, and other species of *Ephedra* (Fam. *Gnetaceæ*),

or produced synthetically. It is anhydrous, or contains not more than one-half molecule of water of hydration.

Anhydrous Ephedrine contains not less than 98.5 per cent of $C_{10}H_{15}NO$. Hydrated Ephedrine contains not less than 94 per cent of $C_{10}H_{15}NO$.

Description—Ephedrine occurs as an unctuous, almost colorless solid, or white crystals or granules. It gradually decomposes on exposure to light.

Solubility—Ephedrine is soluble in water, in alcohol, in chloroform, and in ether, and is moderately and slowly soluble in liquid petrolatum, the solution in the latter becoming turbid if the Ephedrine contains more than about 1 per cent of water.

Melting point—Ephedrine melts between 34° and 40° C., the variability in the melting point being due to differences in the moisture content, Anhydrous Ephedrine having a lower melting point than the hemi-hydrate of Ephedrine.

Optical rotation—Dissolve 0.5 Gm. of Ephedrine in 10 cc. of ether in a tared beaker, add 0.5 cc. of hydrochloric acid, evaporate to dryness, and dry the residue to constant weight in a desiccator over sulfuric acid. Dissolve 0.5 Gm., accurately weighed, of the ephedrine hydrochloride so obtained in sufficient distilled water to make exactly 10 cc. of solution: the specific rotation $[\alpha]_D^{25}$ is not less than -33° and not more than -35.5° , using a 100-mm. tube, page 601.

Identification—

A: Dissolve 10 mg. of Ephedrine in 1 cc. of distilled water with the aid of 1 or 2 drops of diluted hydrochloric acid, and add 0.1 cc. of cupric sulfate T.S. followed by 1 cc. of sodium hydroxide solution (1 in 5): a reddish purple color develops. To the mixture add 1 cc. of ether and shake well: the ether layer is purple and the aqueous layer is blue.

B: Dissolve 50 mg. of Ephedrine in 10 cc. of chloroform, allow the solution to stand over night in a closely covered vessel, and then evaporate it spontaneously: white crystals of ephedrine hydrochloride appear, which, when dissolved in water, respond to the identity tests for *chloride*, page 589.

Ash—Ephedrine yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Ephedrine (1 in 50) is strongly alkaline to litmus.

Chloride—A solution of 0.5 Gm. of Ephedrine shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Dissolve 0.1 Gm. of Ephedrine in 40 cc. of distilled water, and add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity develops within 10 minutes.

Assay—Dissolve about 0.5 Gm. of Ephedrine, accurately weighed without previous drying, in 10 cc. of neutralized alcohol, add 5 drops of methyl red T.S., and an excess of tenth-normal hydrochloric acid, accurately measured. Titrate the excess of acid with tenth-normal sodium hydroxide. Each cc. of tenth-normal hydrochloric acid is equivalent to 0.01652 Gm. of $C_{10}H_{15}NO$.

Labeling—The label shall declare whether the Ephedrine is hydrated or anhydrous. When the quantity of Ephedrine is indicated in the labeling of any preparation of Ephedrine, this shall be understood to be in terms of anhydrous Ephedrine unless otherwise specified.

Storage—Preserve Ephedrine in tight, light-resistant containers, in a cold place.

U. S. P. Products of Ephedrine—Ephedrinæ Hydrochloridum, Ephedrinæ Sulfas, Tabellæ Ephedrinæ Sulfatis.

EPHEDRINÆ HYDROCHLORIDUM

Ephedrine Hydrochloride

Ephedrin. Hydrochlor.

$C_{10}H_{15}NO.HCl$

Mol. wt. 201.69

Ephedrine Hydrochloride, when dried over sulfuric acid for 18 hours,

contains not less than 80 per cent and not more than 82.5 per cent of anhydrous ephedrine ($C_{10}H_{15}NO$).

Description—Ephedrine Hydrochloride occurs as fine, white, odorless crystals or powder. It is affected by light.

Solubility—One Gm. of Ephedrine Hydrochloride dissolves in about 3 cc. of water and in about 14 cc. of alcohol, at 25° C. It is insoluble in ether.

Melting point—Ephedrine Hydrochloride melts between 216° and 220° C.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Ephedrine Hydrochloride, determined in an aqueous solution containing 0.5 Gm. of the salt, previously dried over sulfuric acid for 18 hours, in each 10 cc., is not less than -33° and not more than -35.5° , using a 100-mm. tube, page 601.

Identification—

A: Ephedrine Hydrochloride responds to Identification tests A and B under *Ephedrinæ Sulfas*, page 163.

B: A solution of Ephedrine Hydrochloride in distilled water responds to the tests for chloride, page 589.

Loss on drying—Dry about 0.5 Gm. of Ephedrine Hydrochloride, accurately weighed, over sulfuric acid for 18 hours: the loss in weight does not exceed 2 per cent.

Ash—Ephedrine Hydrochloride yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Ephedrine Hydrochloride (1 in 10) is neutral to litmus paper.

Sulfate—Dissolve 50 mg. of Ephedrine Hydrochloride in 40 cc. of distilled water, and add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity develops within 10 minutes.

Assay—Proceed as directed under *Ephedrinæ Sulfas*, page 164, using about 0.3 Gm. of Ephedrine Hydrochloride, dried over sulfuric acid for 18 hours and accurately weighed: the ephedrine found is not less than 80 per cent and not more than 82.5 per cent of the weight of Ephedrine Hydrochloride taken. Each cc. of tenth-normal sulfuric acid is equivalent to 0.01652 Gm. of anhydrous ephedrine ($C_{10}H_{15}NO$).

Storage—Preserve Ephedrine Hydrochloride in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 25 mg.—Apothecaries, $\frac{3}{8}$ grain.

EPHEDRINÆ SULFAS

Ephedrine Sulfate

Ephedrin. Sulf.

$(C_{10}H_{15}NO)_2 \cdot H_2SO_4$

Mol. wt. 428.53

Ephedrine Sulfate, when dried over sulfuric acid for 18 hours, contains not less than 75.5 per cent and not more than 77.3 per cent of anhydrous ephedrine ($C_{10}H_{15}NO$).

Description—Ephedrine Sulfate occurs as fine, white, odorless crystals or as a powder. It is affected by light.

Solubility—Ephedrine Sulfate is freely soluble in water and in hot alcohol. It is less soluble in cold alcohol.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Ephedrine Sulfate, determined by use of a 100-mm. tube and in an aqueous solution containing 0.5 Gm. of the salt, previously dried over sulfuric acid for 18 hours, in each 10 cc., is not less than -29.5° and not more than -32.0° , page 601.

Identification—

A: Dissolve 10 mg. of Ephedrine Sulfate in 1 cc. of distilled water, and add 0.1 cc. of cupric sulfate T.S., followed by 1 cc. of sodium hydroxide solution

(1 in 5): a reddish purple color develops. To the mixture add 1 cc. of ether, and shake well: the ether layer becomes purple and the aqueous layer blue.

B: Dissolve about 0.1 Gm. of Ephedrine Sulfate in 10 cc. of distilled water in a separator, add 1 cc. of ammonia T.S., and extract with two successive 15-cc. portions of chloroform. Filter the chloroform solutions through a chloroform-saturated pledget of purified cotton, allow to stand over night, then allow the chloroform to evaporate spontaneously: white crystals of ephedrine hydrochloride appear, which, when dissolved in water, respond to the identity tests for chloride, page 589.

C: A solution of Ephedrine Sulfate in distilled water responds to the tests for sulfate, page 592.

Loss on drying—Dry about 0.5 Gm. of Ephedrine Sulfate, accurately weighed, over sulfuric acid for 18 hours: the loss in weight does not exceed 2 per cent.

Ash—Ephedrine Sulfate yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Ephedrine Sulfate (1 in 10) is neutral to litmus paper.

Chloride—A 0.2-Gm. portion of Ephedrine Sulfate shows no more chloride than corresponds to 0.4 cc. of fiftieth-normal hydrochloric acid, page 626.

Assay—Weigh accurately about 0.4 Gm. of Ephedrine Sulfate, previously dried over sulfuric acid for 18 hours, and transfer it to a separator containing 10 cc. of distilled water saturated with sodium chloride. Add 5 cc. of normal sodium hydroxide, and extract first with 20 cc. of ether, then with six successive 10-cc. portions of ether, collecting the ether extracts in a second separator. Wash the combined ether extracts with two successive 5-cc. portions of distilled water saturated with sodium chloride, and transfer the water to another separator. Shake the wash water with 10 cc. of ether, add this ether to the ether extract in the second separator, and discard the wash water. Extract the ether solution first with 25 cc. of tenth-normal sulfuric acid, accurately measured, then successively with 10 cc. and 5 cc. of distilled water. Combine the sulfuric acid and water extracts in a beaker, and warm on a water bath until the odor of ether is no longer perceptible. Cool the solution, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.01652 Gm. of anhydrous ephedrine ($C_{10}H_{15}NO$).

Storage—Preserve Ephedrine Sulfate in well-closed, light-resistant containers.

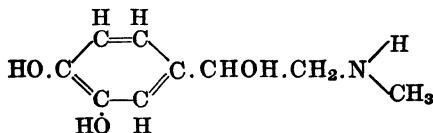
U. S. P. Product of Ephedrine Sulfate—Tabellæ Ephedrinæ Sulfatis.

AVERAGE DOSE—Metric, 25 mg.—Apothecaries, $\frac{3}{8}$ grain.

EPINEPHRINA

Epinephrine

Epineph.



$C_9H_{13}O_3N$

Mol. wt. 183.20

Description—Epinephrine occurs as a white or light brownish, microcrystalline, odorless powder, gradually darkening on exposure to air. It combines with acids, forming salts which are readily soluble in water, and from these solutions the base may be precipitated by ammonia water or by alkali carbonates. It is affected by light.

Solubility—Epinephrine is very slightly soluble in water and in alcohol. It is insoluble in ether, in chloroform, and in fixed and volatile oils.

Optical rotation—Dissolve 1 Gm. of Epinephrine, previously dried to constant weight over sulfuric acid, in sufficient half-normal hydrochloric acid to make a volume of 20 cc. at 25° C. The specific rotation, $[\alpha]_D^{25}$, of this solution, using a 200 mm. tube, is not less than -50° and not more than -53.5° , page 601.

Identification—A slightly acid, aqueous solution of Epinephrine (1 in 1000) treated with ferric chloride T.S. has an emerald green color which changes to cherry red and finally to brown on standing. Other oxidizing agents produce red, pink, or violet colors which change to brown.

Loss on drying—When dried over sulfuric acid for 18 hours, Epinephrine loses not more than 2 per cent of its weight.

Ash—The ash from 0.1 Gm. of Epinephrine is negligible, page 556.

Reaction—A saturated, aqueous solution of Epinephrine is slightly alkaline to litmus paper.

Vegetable alkaloids—An acid solution of Epinephrine is not visibly affected by solutions of trinitrophenol, tannic acid, phosphomolybdic acid, mercuric potassium iodide, and of platinic chloride.

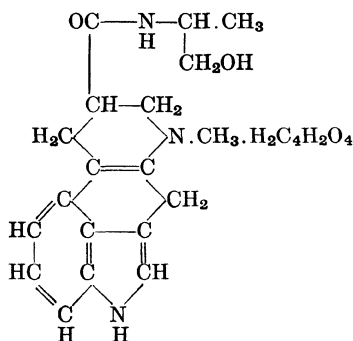
Storage—Preserve Epinephrine in tight, light-resistant containers.

U. S. P. Products of Epinephrine—Injectio Epinephrinae Hydrochloridi, Liquor Epinephrinae Hydrochloridi, Nebula Epinephrinae Hydrochloridi.

ERGONOVINÆ MALEAS

Ergonovine Maleate

Ergonov. Mal.



$C_{19}H_{23}N_3O_2 \cdot C_4H_4O_4$

Mol. wt. 441.47

The maleate of an alkaloid obtained from ergot.

Ergonovine Maleate, when dried to constant weight over sulfuric acid, contains not less than 98 per cent of $C_{19}H_{23}N_3O_2 \cdot C_4H_4O_4$.

Description—Ergonovine Maleate occurs as a white, or faintly yellow, odorless, microcrystalline powder. It is affected by light.

Solubility—One Gm. of Ergonovine Maleate dissolves in about 36 cc. of water, and in about 120 cc. of alcohol, at 25° C. It is insoluble in ether and in chloroform.

Melting point—Ergonovine Maleate melts with decomposition at about 167° C.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Ergonovine Maleate, previously dried to constant weight over sulfuric acid and determined by use of a 100-mm. tube and in an aqueous solution containing 0.1 Gm. of Ergonovine Maleate in each 10 cc., is not less than $+48^\circ$ and not more than $+57^\circ$, page 601.

Identification—

- A: An aqueous solution of Ergonovine Maleate has a blue fluorescence.
 B: Dissolve about 2 mg. of Ergonovine Maleate in 20 cc. of distilled water. To 1 cc. of this solution add 2 cc. of a 1 in 80 solution of paradimethylamino-benzaldehyde in 65 per cent sulfuric acid containing 0.1 Gm. of ferric chloride in each 1000 cc.: after about 10 minutes the mixture exhibits a deep blue color.

Loss on drying—When dried to constant weight over sulfuric acid, Ergonovine Maleate loses not more than 2 per cent of its weight.

Ergotoxine and ergotamine—When heated to boiling with an aqueous solution of sodium hydroxide (1 in 10) Ergonovine Maleate does not evolve ammonia and no precipitate is produced by mercuric potassium iodide T.S. in an aqueous solution of Ergonovine Maleate (1 in 10,000).

Assay—Dissolve about 0.1 Gm. of Ergonovine Maleate, previously dried to constant weight over sulfuric acid and accurately weighed, in 2 cc. of alcohol and 3 cc. of stronger ammonia T.S. in a suitable separator. Add 50 cc. of a saturated aqueous solution of sodium chloride, and extract with eight successive 25-cc. portions of ether. Collect the ether extracts in a beaker, and evaporate the ether on a water bath to not more than 2 cc. Add 25 cc. of fiftieth-normal hydrochloric acid, accurately measured, and warm on a water bath to remove any traces of ether and to insure complete solution of the ergonovine. Add 20 cc. of distilled water, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using 5 drops of bromophenol blue T.S. as the indicator, continuing the titration until a purplish blue color appears. Each cc. of fiftieth-normal hydrochloric acid is equivalent to 0.008829 Gm. of $C_{19}H_{23}N_3O_2 \cdot C_4H_4O_4$.

Storage—Preserve Ergonovine Maleate in tight, light-resistant containers.

U. S. P. Product of Ergonovine Maleate—Tabellæ Ergonovinæ Maleatis.

AVERAGE DOSE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

ERGOTA

Ergot

Ergot.—Ergot of Rye, *Secale cornutum* P.I.

Ergot is the dried sclerotium of *Claviceps purpurea* (Fries) Tulasne (Fam. *Hypocreaceæ*) developed on rye plants.

The potency of Ergot shall be such that, when assayed as directed, 1 Gm. shall be equivalent to not less than 0.5 milligram of the U. S. P. Ergotoxine Ethanesulfonate Reference Standard.

It contains not more than 6 per cent of moisture, and not more than 4 per cent of seeds, fruits, and other foreign organic matter, page 628.

Description—

Unground Ergot—Cylindraceous, obscurely 3-angled, usually tapering toward both ends, obtuse, somewhat curved, from 0.7 to 4.5 cm. in length and up to 5 mm. thick, longitudinally furrowed, occasionally transversely fissured; externally nearly black or purplish brown; fracture short; internally white, sometimes a relatively few sclerotia tinged with pink, lavender, or gray; odor characteristic but free from mustiness or rancidity; taste oily, somewhat acid, disagreeable.

Histology—A thin outer portion of small compact hyphal cells generally deep violet in color, turning red with 50 per cent sulfuric acid or with chloral hydrate T.S.; within this a pseudo-parenchyma composed of colorless hyphal cells

usually less than 20 microns in diameter, occasionally up to 28 microns in diameter, slightly elongated in longitudinal sections and having thin, chitinous walls, and containing protein and numerous globules of fixed oil.

Powdered Ergot—Grayish to purplish brown; containing purplish and whitish fragments of the outer tissue and of the thin-walled hyphal cells.

Identification—Shake 1 Gm. of powdered Ergot in a closed flask for about 5 minutes with 20 cc. of ether and about 15 drops of 20 per cent sulfuric acid. Filter, and shake the filtrate thoroughly with 15 drops of a cold, saturated aqueous solution of sodium bicarbonate. The separated lower, aqueous layer is red or violet (sclererythrin).

Purity—When crushed or powdered, Ergot does not develop a rancid or ammoniacal odor upon the addition of hot water.

Assay—Reduce an appropriate quantity of the Ergot to be assayed to a coarse powder, defat it by percolation with purified benzin as directed under *Fluidextractum Ergotæ*, page 192, and make a preparation of the defatted drug, employing Type Process C for Fluidextracts, page 189, and using proportionate amounts of the drug and a menstruum consisting of 2 volumes of hydrochloric acid to each 98 volumes of diluted alcohol. Adjust the volume of the final mixed percolate so that 1 cc. is the equivalent of 1 Gm. of the Ergot taken, and proceed as follows:

For this assay select single comb, white Leghorn cocks which have the following characteristics: they shall be not more than 24 months of age, and shall weigh not less than 1.5 kilograms and not more than 2.5 kilograms. Each cock to be used shall be standardized by determining the smallest dose, known as the threshold dose, of a freshly prepared, 1 in 100, aqueous solution of tartaric acid containing 0.5 milligram of ergotoxine ethanesulfonate per cubic centimeter, which, when injected deeply into the breast muscles of the cock shall produce, within 1 hour to 1½ hours, a partial but characteristic darkening of the comb. The discoloration produced by the standard which is to be considered satisfactory for the purpose of comparison shall be such that the anterior portion of the comb shows little or no effect, the middle section is moderately darkened, and the posterior area shows a more pronounced darkening. A cock to be acceptable for this assay must show a greater degree of darkening in the comb than was produced by the threshold dose when injected with a dose of the standard 25 per cent larger than the threshold dose.

In the same manner, and using these standardized cocks, inject the fluid preparation of Ergot to be assayed, employing a dose of the same volume, per kilogram of body weight, as the previously determined threshold dose of the standard. The preparation which is being assayed shall produce a darkening of the comb at least as intense as that produced by the threshold dose of the standard.

Cocks must not be used for testing purposes at intervals shorter than 1 week and then not until all traces of discoloration from a previous test have disappeared.

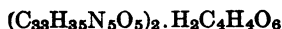
Storage—Preserve Ergot under all conditions of storage and transportation in water-proof and air-tight containers. A suitable cartridge containing a non-liquefying, inert, dehydrating substance may be inserted in the container to maintain low humidity.

U. S. P. Products of Ergot—Ergonovinæ Maleas, Ergotaminæ Tartras, Fluidextractum Ergotæ, Tabellæ Ergonovinæ Maleatis, Tabellæ Ergotaminæ Tartratis.

ERGOTAMINÆ TARTRAS

Ergotamine Tartrate

Ergotam. Tart.



Mol. wt. 1312.67

The tartrate of an alkaloid obtained from ergot.

Description—Ergotamine Tartrate occurs as colorless crystals or as a white, crystalline powder, usually containing solvent of crystallization. These crystals lose the solvent of crystallization in a high vacuum.

Solubility—One Gm. of Ergotamine Tartrate dissolves in about 500 cc. of water and in 500 cc. of alcohol, at 25° C.

Melting point—Ergotamine Tartrate darkens on heating at 177° C., and at 184° C. it decomposes.

Optical Rotation—The specific rotation $[\alpha]_D^{25}$ of a solution of Ergotamine Tartrate in chloroform, containing 0.4 Gm. in each 100 cc., and using a 100-mm. tube, is not less than -125° and not more than -155° , page 601.

Identification—

A: Dissolve 1 mg. of Ergotamine Tartrate in a mixture of 5 cc. of glacial acetic acid and 5 cc. of ethyl acetate. To 1 cc. of this solution add slowly with continuous agitation and cooling 1 cc. of sulfuric acid: a blue color with a red tinge develops. Add 0.1 cc. of ferric chloride T.S., previously diluted with an equal volume of distilled water: the red tinge becomes less apparent and the blue color more pronounced.

B: To 2 cc. of solution of Ergotamine Tartrate (1 in 10,000) add 0.1 cc. of potassium mercuric iodide T.S.: a slight turbidity appears.

Foreign substances—In a subdued light transfer 0.5 Gm. of Ergotamine Tartrate to a separator containing 20 cc. of distilled water and 1 cc. of ammonia T.S. Shake the solution with three portions of chloroform (20 cc., 15 cc., and 15 cc.), combine the chloroform extracts, and evaporate spontaneously. Transfer a weighed portion of the residue to a beaker, and add ten times the weight of acetone at 30° C. If the solid matter does not dissolve, mark the height of the liquid in the beaker, then add twice the volume of acetone already present, and warm the mixture. If the solid matter still does not dissolve, filter the mixture, reject the residue, and evaporate the filtrate to the volume already marked. Add 0.7 part of water, and keep at 0° C. for 2 hours. Filter off the crystals, and wash with 2 cc. of ether: the crystals are rhombic and highly refractory. Dry the crystals for 24 hours in a desiccator; the crystals lose their solvent of crystallization and become a lusterless powder which on being heated blackens at 174° C. and decomposes with evolution of gas at 181° to 182° C. The powder is very soluble in chloroform and in glacial acetic acid, but is less soluble in alcohol, benzene, and ether.

Storage—Preserve Ergotamine Tartrate in well-closed containers protected from light and heat.

U. S. P. Product of Ergotamine Tartrate—*Tabellæ Ergotaminæ Tartratis*.

AVERAGE DOSE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

ERIODICTYON

Eriodictyon

Eriodict.—Yerba Santa

Eriodictyon is the dried leaf of *Eriodictyon californicum* (Hooker et Arnott) Torrey (Fam. *Hydrophyllaceæ*).

Eriodictyon contains not more than 5 per cent of its stems, and not more than 2 per cent of other foreign organic matter, page 628.

Description—

Unground Eriodictyon—Usually in fragments; when entire, lanceolate, from 5 to 15 cm. in length and from 1 to 3 cm. in breadth; apex acute; base slightly tapering into a short petiole; margin irregularly serrate or crenate-dentate; upper surface from yellowish to weak brown or greenish brown, covered with a more or less glistening resin; lower surface light yellowish brown to weak greenish

yellow, reticulate with conspicuous veins, and minutely tomentose between the reticulations; thick, brittle; odor aromatic; taste balsamic, bitter, becoming sweetish and slightly acid.

Histology—Upper epidermis with large cells, the outer walls very uneven in cross sections, owing to indentations which appear as striations in surface view, and with numerous deep-seated glandular hairs, possessing a 1- to 3-celled stalk and an up to 8-celled glandular head, but non-glandular hairs absent on this epidermis. Palisade cells very narrow, from 2 to 6 rows deep, in which are interspersed regularly arranged perpendicular rows of parenchyma cells each containing a calcium oxalate rosette aggregate; cells of spongy parenchyma forming but a few layers; vascular tissues not strongly developed except in the midrib and more prominent veins; lower surface in cross section showing numerous sinuses lined by the lower epidermis from which occasional deep-seated glandular and many curved non-glandular hairs emanate and nearly fill the sinuses, frequently concealing the stomata.

Powdered Eriodictyon—Greenish yellow; non-glandular hairs 1-celled, undulate with thick walls, up to 250 microns in length and up to about 10 microns in width; glandular hairs with 1- to 3-celled stalks and up to 8-celled heads, the latter up to 75 microns in diameter; fragments of palisade tissue containing regularly arranged columnar parenchyma cells each containing a rosette aggregate of calcium oxalate; tracheæ with spiral thickenings or simple pores and associated with lignified fibers; calcium oxalate in rosette aggregates numerous and from 5 to 30 microns in diameter.

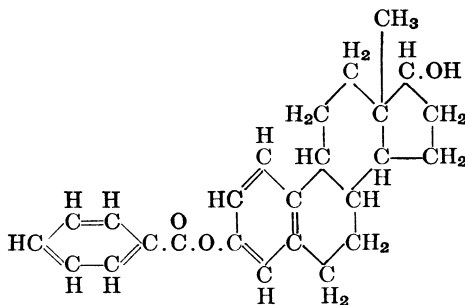
Eriodictyon californicum stems show a subepidermal cork, a primary cortex of 10 to 20 rows of rounded parenchyma cells, a pericycle containing a nearly closed ring of lignified sclerenchyma, a narrow phloem, a xylem region consisting of wood wedges separated by medullary rays one cell in width, the xylem wedges containing numerous strongly lignified wood-fibers and spiral and pitted tracheæ, and a broad pith.

U. S. P. Product of Eriodictyon—Fluidextractum Eriodictyi.

ESTRADIOLIS BENZOAS

Estradiol Benzoate

Estradiol. Benz.—Estradiol Benzoate



$C_{26}H_{38}O_3$

Mol. wt. 376.47

The benzoate of alpha-estradiol.

Description—Estradiol Benzoate occurs as a white or slightly yellow to brownish, crystalline powder. It is odorless, and is stable in air.

Solubility—Estradiol Benzoate is almost insoluble in water; it is soluble in alcohol, in acetone, and in dioxane. It is slightly soluble in ether, and sparingly soluble in sesame and other vegetable oils.

Melting point—Estradiol Benzoate melts between 191° and 196° C., page 595.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ determined in a solution in dioxane, containing in each 10 cc. 0.20 Gm. of Estradiol Benzoate, previously dried for 4 hours over sulfuric acid, and using a 100 mm. tube, is not less than +58° and not more than +63°, page 601.

Identification—

- A: Dissolve 2 mg. of Estradiol Benzoate in 2 cc. of sulfuric acid: the solution is greenish yellow and exhibits a blue fluorescence. When this solution is diluted with 2 cc. of distilled water, the color changes to pale orange.
- B: Dissolve 0.1 Gm. of Estradiol Benzoate in 10 cc. of methanol, add 100 mg. of potassium carbonate dissolved in 0.5 cc. of water, and reflux the mixture on the steam bath for 2 hours. Add 30 cc. of water, and heat gently until the alcohol is evaporated. Then add 15 cc. of distilled water, and keep the solution at a temperature between 5° and 10° C. for 1 hour. Filter the precipitate, wash it with cold distilled water until the washings are neutral to litmus paper, then dry it at about 80° C. The estradiol so obtained melts between 174° and 179° C.
- C: Mix 50 mg. of sulfanilic acid with 2 cc. of diluted hydrochloric acid, warm the mixture, then cool it in ice water, and slowly add, with agitation, 0.3 cc. of an aqueous solution of sodium nitrite (1 in 10). Dissolve 5 mg. of the estradiol obtained in *Identification test B* in 5 cc. of an aqueous solution of potassium hydroxide (1 in 10), and add this solution to the diazotized sulfanilic acid: a deep red color is produced.
- D: Evaporate the filtrate from *Identification test B* to about 5 cc., cool, filter if necessary, and add to the filtrate 2 cc. of diluted hydrochloric acid: a white precipitate is formed. Extract the precipitate with 5 cc. of ether, evaporate the ether, and dry the residue at about 70° C. The melting point of the benzoic acid so obtained is between 120° and 122° C.

Completeness and reaction of solution—Dissolve 0.1 Gm. of Estradiol Benzoate in 5 cc. of warm alcohol: no insoluble residue remains, and the solution after cooling is only slightly acid to litmus paper.

Ash—The ash from 0.1 Gm. of Estradiol Benzoate is negligible, page 556.

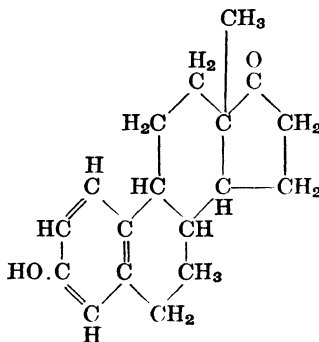
Storage—Preserve Estradiol Benzoate in well-closed, light-resistant containers.

AVERAGE DOSE—Oral, Metric, 1 mg.—Apothecaries, $\frac{1}{60}$ grain.

ESTRONUM

Estrone

Estron.—Theelin, Estrone



$C_{18}H_{22}O_2$

Mol. wt. 270.36

Description—Estrone occurs as small, white crystals, or as a white, crystalline powder. It is odorless and is stable in air.

Solubility—Estrone is slightly soluble in water but is soluble in alcohol, in acetone, in dioxane, and in solutions of fixed alkali hydroxides.

Melting point—Estrone melts between 258° and 262° C., page 595.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Estrone, determined in a dioxane solution containing 1 Gm. of Estrone in 100 cc. of solution and using a 200-mm. tube, is not less than +155° and not more than +165°, page 601.

Identification—

A: Dissolve 50 mg. of Estrone in 6 cc. of pyridine and 2 cc. of acetic anhydride, and heat at 95° C. for 24 hours. Add 10 cc. of diluted alcohol and evaporate in a vacuum to a thick oil. Add about 1 cc. of diluted alcohol and set aside to crystallize. Filter out the crystals and recrystallize twice from hot alcohol: the estrone acetate so obtained melts between 125° and 127° C.

B: Dissolve 50 mg. of Estrone and 50 mg. of hydroxylamine in 10 cc. of alcohol, add 1 cc. of glacial acetic acid, and boil under a reflux condenser for 5 hours. Add 10 cc. of distilled water and recrystallize the precipitate twice from hot alcohol: the estrone oxime so obtained melts between 229° and 231° C.

Ash—The ash from 0.1 Gm. of Estrone is negligible, page 556.

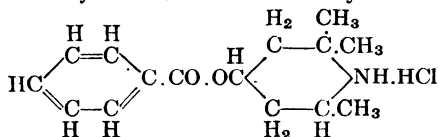
Storage—Preserve Estrone in tight, light-resistant containers.

AVERAGE DOSE—Intramuscular, Metric, 1 mg.—Apothecaries, $\frac{1}{60}$ grain.

EUCAINÆ HYDROCHLORIDUM

Eucaïne Hydrochloride

Eucaïn. Hydrochlor.—Betaeucaïne Hydrochloride



$C_{15}H_{21}O_2N.HCl$

Mol. wt. 283.79

Eucaïne Hydrochloride, when dried to constant weight at 100° C., contains not less than 99 per cent of $C_{15}H_{21}O_2N.HCl$.

Description—Eucaïne Hydrochloride occurs as a white, odorless, crystalline powder. It is stable in air, but is affected by light.

Solubility—One Gm. of Eucaïne Hydrochloride dissolves in 30 cc. of water, in 35 cc. of alcohol, and in about 6 cc. of chloroform, at 25° C. It is more soluble in boiling water and in boiling alcohol.

Identification—

A: Dissolve about 0.1 Gm. of Eucaïne Hydrochloride in 1 cc. of sulfuric acid. Keep the solution at 100° C. for 5 minutes, and then mix it cautiously with 2 cc. of distilled water: the mixture develops an aromatic odor of methyl benzoate, and on cooling deposits crystals of benzoic acid.

B: Separate 10-cc. portions of a saturated, aqueous solution of Eucaïne Hydrochloride yield a white, curdy precipitate on the addition of mercuric chloride T.S., and a yellowish, curdy precipitate with a few drops of a mixture of equal volumes of potassium chromate T.S. and diluted sulfuric acid.

C: Silver nitrate T.S. produces in an aqueous solution of Eucaïne Hydrochloride (1 in 100) a white precipitate which is insoluble in nitric acid.

Loss on drying—When dried over sulfuric acid for 18 hours, Eucaïne Hydrochloride loses not more than 1 per cent of its weight.

Cocaine hydrochloride—Triturate about 50 mg. of Eucaïne Hydrochloride with

about 5 times its weight of mild mercurous chloride, and moisten the mixture with a few drops of distilled water: no black color is produced.

Ash—The ash from 0.5 Gm. of Eucaine Hydrochloride is negligible, page 556.

Carbonizable substances—Dissolve 0.1 Gm. of Eucaine Hydrochloride in 1 cc. of sulfuric acid: the solution is colorless.

Reaction—An aqueous solution of Eucaine Hydrochloride (1 in 50) is neutral to litmus paper.

Cocaine and alphaeucaine—Add 5 cc. of mercuric chloride T.S. to 5 cc. of an aqueous solution of Eucaine Hydrochloride (1 in 100): no permanent precipitate is produced.

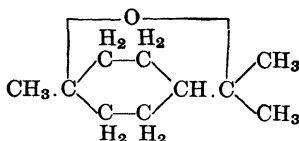
Assay—Dissolve about 0.5 Gm. of Eucaine Hydrochloride, previously dried to constant weight at 100° C. and accurately weighed, in 100 cc. of neutralized alcohol. Titrate this alcoholic solution with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.02838 Gm. of $C_{15}H_{21}O_2N.HCl$.

Storage—Preserve Eucaine Hydrochloride in well-closed, light-resistant containers.

EUCALYPTOL

Eucalyptol

Cineol



$C_{10}H_{18}O$

Mol. wt. 154.24

Eucalyptol is obtained from oil of eucalyptus and from other sources.

Description—Eucalyptol is a colorless liquid, having a characteristic, aromatic, distinctly camphoraceous odor, and a pungent, cooling, spicy taste.

Solubility—Eucalyptol is insoluble in water, but is soluble in 5 volumes of 60 per cent alcohol. It is miscible with alcohol, chloroform, ether, glacial acetic acid, and with fixed and volatile oils.

Specific gravity—The specific gravity of Eucalyptol is not less than 0.921 and not more than 0.924 at 25° C.

Congealing point—The congealing point of Eucalyptol is not below 0° C., page 565.

Boiling range—Eucalyptol distils between 174° and 177° C., page 559.

Optical rotation—The optical rotation of Eucalyptol is not more than $\pm 0.3^\circ$ in a 100 mm. tube at 25° C., page 601.

Refractive index—The refractive index of Eucalyptol is not less than 1.4550 and not more than 1.4600 at 20° C., page 608.

Identification—Place 1 cc. of Eucalyptol in a test tube, in a freezing mixture, and gradually add an equal volume of phosphoric acid: a solid, white, crystalline mass of eucalyptol-phosphoric acid forms, from which Eucalyptol separates upon the addition of warm distilled water.

Reaction—An alcoholic solution of Eucalyptol (1 in 10) is neutral to moistened litmus paper.

Phenols—

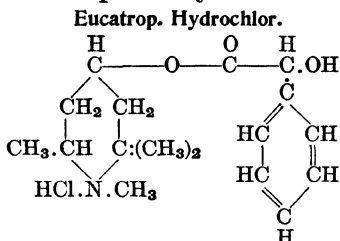
A: Shake 5 cc. of Eucalyptol with 5 cc. of sodium hydroxide T.S.: the volume of the Eucalyptol is not diminished.

B: Shake 1 cc. of Eucalyptol with 20 cc. of distilled water, and allow the liquids to separate. To 10 cc. of the aqueous layer, separated from the Eucalyptol, add 1 drop of ferric chloride T.S.: the mixture develops no violet color.

Storage—Preserve Eucalyptol in tight containers.

EUCATROPINÆ HYDROCHLORIDUM

Eucatropine Hydrochloride



Mol. wt. 327.84

Eucatropine Hydrochloride, when dried over sulfuric acid for 4 hours, contains not less than 86 per cent and not more than 89 per cent of eucatropine ($\text{C}_{17}\text{H}_{25}\text{O}_3\text{N}$).

Description—Eucatropine Hydrochloride occurs as a white, granular, odorless powder.

Solubility—Eucatropine Hydrochloride is very soluble in water, freely soluble in alcohol and in chloroform; it is insoluble in ether.

Melting point—The melting point of Eucatropine Hydrochloride is not below 183°C ., page 595.

Identification—

A: Aqueous solutions of Eucatropine Hydrochloride (1 in 50) are precipitated by sodium carbonate T.S., mercuric potassium iodide T.S., iodine T.S., trinitrophenol T.S., and many other reagents for alkaloids.

B: Recrystallize the free base, obtained in the assay, from purified benzin: the melting point of the dried crystals is not below 111°C ., page 595.

Ash—Eucatropine Hydrochloride yields not more than 0.1 per cent of ash, page 556.

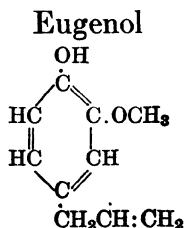
Reaction—An aqueous solution of Eucatropine Hydrochloride (1 in 50) is neutral to litmus paper.

Atropine, scopolamine or hyoscyamine—Add 5 drops of nitric acid to about 50 mg. of Eucatropine Hydrochloride, evaporate to dryness on a water bath, cool the residue, and add 5 drops of half-normal alcoholic potassium hydroxide together with a fragment of potassium hydroxide: no violet color results.

Assay—Dissolve about 1 Gm. of Eucatropine Hydrochloride, previously dried for 4 hours over sulfuric acid and accurately weighed, in 10 cc. of distilled water. Make alkaline with ammonia T.S., and extract with successive portions of ether until the alkaloid is completely extracted. Wash the combined ether extracts with 10 cc. of distilled water, and extract the water washing with 10 cc. of ether. Allow the combined ether solutions to evaporate spontaneously, and dry the residue of eucatropine to constant weight at 80°C .

Storage—Preserve Eucatropine Hydrochloride in tight, light-resistant containers.

EUGENOL



Mol. wt. 164.20

Eugenol is a phenol obtained from oil of clove and from other sources.

Description—Eugenol is a colorless, or pale yellow, thin liquid, having a strongly aromatic odor of clove and a pungent, spicy taste. Exposure to air causes it to become darker and thicker. Eugenol is optically inactive.

Solubility—Eugenol is slightly soluble in water, but is miscible with alcohol, with chloroform, with ether, and with fixed oils. It is soluble in twice its volume of 70 per cent alcohol, page 649.

Specific gravity—The specific gravity of Eugenol is not less than 1.064 and not more than 1.070 at 25° C.

Refractive index—The refractive index of Eugenol is not less than 1.5400 and not more than 1.5420 at 20° C.

Boiling range—Eugenol distills between 250° and 255° C.

Hydrocarbons—Dissolve 1 cc. of Eugenol in 20 cc. of half-normal sodium hydroxide in a 50-cc. stoppered tube, add 18 cc. of distilled water, and mix: a clear mixture results immediately but it may become turbid when exposed to air.

Phenol—Shake 1 cc. of Eugenol with 20 cc. of distilled water, filter, and add 1 drop of ferric chloride T.S. to 5 cc. of the clear filtrate: the mixture exhibits a transient grayish green color but not a blue or violet color.

Storage—Preserve Eugenol in tight, light-resistant containers.

EXTRACTA

Extracts

Extracts are concentrated preparations of vegetable or animal drugs obtained by extracting the active constituents of the respective drugs with suitable menstrua, evaporating all or nearly all of the solvent and adjusting the residual masses or powders to the prescribed standards.

Extracts are made in three forms: Semi-liquids or those of syrupy consistence; plastic masses, known as *pilular extracts*; and dry powders, known as *powdered extracts*. Pilular extracts and powdered extracts of any one drug are interchangeable medicinally, but each has its pharmaceutical advantages.

In the manufacture of most extracts, the drugs are extracted by the process of percolation. The rate of flow of percolates, directed under the several monographs, is defined on page 188. The entire percolates are concentrated by distillation under reduced pressure, with a few exceptions, in order to expose the drug principles to as little heat as possible. If the active principles of a drug are damaged by high temperatures or by prolonged heating, the temperature at which its percolate is concentrated is not to exceed 60° C. at any stage.

Diluents—Extracts which must be adjusted to prescribed standards may need diluents for that purpose. While in this Pharmacopœia liquid glucose is directed as the diluent for pilular extracts, and starch dried at 100° C. for powdered extracts, the following additional diluents

are permitted: malt extract for pilular extracts, and for powdered extracts, sucrose, lactose, powdered glycyrrhiza, magnesium carbonate, magnesium oxide, calcium phosphate, or finely powdered marc remaining after the extraction of the drug. Magnesium carbonate and magnesium oxide should not be used in powdered extracts of belladonna, hyoscyamus, and stramonium. The diluent for a powdered extract may be colored with chlorophyll or caramel to produce a color corresponding to the normal color of the extract, but an excess of coloring agent must not be added.

Defatting extracts—Powdered extracts which are made from drugs that contain a material proportion of inactive oily or fatty matter should have this removed in order to obtain a satisfactory product. Any suitable method for defatting either the drug or the extract may be employed. The following methods of treating the extract are recommended:

Method I—Prepare the extract in the regular manner to the point where before final adjustment it is dried with a portion of starch. To this dry powder add purified benzin (about 300 cc. of benzin for each 100 Gm. of drug extracted) and stir well several times during 2 hours. Allow to settle and decant or drain off the excess of liquid. Mix the residue with another (smaller) portion of purified benzin, stir thoroughly, and separate the excess of benzin. Repeat the washing with a third portion of purified benzin, then drain the powder, and dry it thoroughly at a temperature not exceeding 70° C. Weigh the dried powder, and adjust it to the prescribed quantity or strength.

Method II—To the soft extract obtained by the evaporation of the percolate, add slightly acidulated water at a temperature of about 80° C. in the proportion of about 80 cc. of acidulated water to each 100 Gm. of soft extract or crude drug represented. Stir the mixture thoroughly, and allow it to stand until almost cold. Remove and discard any oily or fatty matter which has risen, then separate and retain the aqueous liquid. Treat the undissolved extract residue twice as just described, combine and evaporate the aqueous liquids to a soft extract at a temperature not exceeding 70° C. Mix the soft extract thus obtained with a portion of starch, dry the mixture at a temperature not exceeding 70° C., and complete the extract in the usual way.

The acidulated water suggested above should contain about 0.05 per cent of HCl or about 0.2 per cent of tartaric acid.

Storage—Preserve Extracts in tight, light-resistant containers, preferably at a temperature not above 30° C.

EXTRACTUM BELLADONNÆ

Extract of Belladonna

Ext. Bellad.—*Extractum Belladonnæ Foliorum*, *Extractum Belladonnæ P.I.*

Extract of Belladonna yields, from each 100 Gm., not less than 1.15 Gm. and not more than 1.35 Gm. of the alkaloids of belladonna leaf.

PILULAR EXTRACT OF BELLADONNA

Prepare an extract by percolating 1000 Gm. of belladonna leaf, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug during 16 hours and then percolate it at a moderate rate. Evaporate the percolate to a pilular consistence under reduced pressure and at a temperature not exceeding 60° C., and adjust the remaining extract, after assaying, by dilution with liquid glucose so that the finished Extract will contain, in each 100 Gm., 1.25 Gm. of the alkaloids of belladonna leaf.

Assay—Proceed as directed under the *Assay of Pilular Extract of Hyoscyamus*, page 179, using approximately 3 Gm. of Pilular Extract of Belladonna, accurately weighed. Each cc. of fiftieth-normal acid is equivalent to 0.00578 Gm. of the alkaloids of belladonna leaf.

POWDERED EXTRACT OF BELLADONNA

Prepare an extract by percolating 1000 Gm. of belladonna leaf, using alcohol as the menstruum. Macerate the drug during 16 hours and then percolate it slowly. Evaporate the percolate to a soft extract under reduced pressure and at a temperature not exceeding 60° C., add 50 Gm. of dry starch, and continue the evaporation, at the same temperature, until the product is dry. Powder the residue. The extract may be deprived of its fat by treating either the soft extract first obtained, or the dry and powdered extract, as directed under *Extracta*, page 175. Assay the powdered residue and add sufficient starch, dried at 100° C., to make the finished Extract contain, in each 100 Gm., 1.25 Gm. of the alkaloids of belladonna leaf. Mix the powders thoroughly and pass the Extract through a fine sieve.

Assay—Proceed as directed under the *Assay of Powdered Extract of Hyoscyamus*, page 180, using approximately 3 Gm. of Powdered Extract of Belladonna, accurately weighed. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of belladonna leaf.

U. S. P. Product of Extract of Belladonna—*Unguentum Belladonnæ*.

AVERAGE DOSE—Metric, 15 mg.—Apothecaries, $\frac{1}{4}$ grain.

EXTRACTUM CASCARÆ SAGRADÆ**Extract of Cascara Sagrada**

Ext. Casc. Sagr.—Powdered Extract of Cascara Sagrada,
Extract of Rhamnus Purshiana

One Gm. of the Extract represents 3 Gm. of cascara sagrada.

Mix 900 Gm. of cascara sagrada, in coarse powder, with 4000 cc. of boiling water, and macerate the mixture during 3 hours. Then transfer it to a percolator, allow it to drain, and exhaust it by percolation, using boiling water as the menstruum and collecting about 5000 cc. of percolate. Evaporate the percolate to dryness, reduce the extract to a fine powder, and add sufficient starch, dried at 100° C., to make the product weigh 300 Gm. Mix the powders thoroughly and pass the Extract through a fine sieve.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

EXTRACTUM FELLIS BOVIS**Extract of Ox Bile**

Ext. Fel. Bov.—Powdered Extract of Oxgall

Extract of Ox Bile contains an amount of the sodium salts of ox bile acids equivalent to not less than 45 per cent of cholic acid ($C_{24}H_{40}O_5$).

Description—Extract of Ox Bile is a brownish yellow, greenish yellow or brown powder, having a bitter taste.

Solubility—Extract of Ox Bile is soluble in water and in alcohol. The solutions foam strongly when shaken.

Reaction—An aqueous solution of Extract of Ox Bile (1 in 20) is neutral or slightly acid to litmus paper.

Insoluble substances—Extract of Ox Bile contains not more than 0.1 per cent of substances insoluble in 80 per cent alcohol.

Assay—Weigh accurately 2.00 Gm. of the Extract and dissolve it in sufficient distilled water to make exactly 100 cc., and mix well. Dilute exactly 5 cc. of the solution with sufficient alcohol to make exactly 100 cc., and mix well. If the solution is not clear, filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate, and keeping the funnel covered with a watch glass during the filtration. Transfer exactly 1 cc. of the clear alcohol solution to a test tube of from 15- to 16-mm. diameter, and remove the alcohol by evaporation in a vacuum at room temperature.

Dissolve 45.0 mg. of U. S. P. Cholic Acid Reference Standard in 1.2 cc. of tenth-normal sodium hydroxide and sufficient alcohol to make exactly 100 cc., and mix well. Transfer exactly 1 cc. of this solution to a test tube of the same diameter and color as that containing the solution of the Extract, and evaporate the alcohol in a vacuum at room temperature.

To each of the tubes add exactly 1 cc. of distilled water to dissolve the residue, then add exactly 1 cc. of a freshly prepared aqueous solution of furfural (1 cc. in 100 cc.), and follow with 6 cc. of a dilute sulfuric acid, made by cautiously mixing 10 cc. of sulfuric acid with 13 cc. of distilled water. Mix thoroughly, and place the tubes in a water bath at 70° C. for 8 minutes. At the expiration of this period, place the tubes immediately in ice water for 2 minutes. The blue color of the solution

containing the Extract tested is not lighter than that of the solution containing the standard. The comparison of the color is preferably made in a suitable colorimeter.

Storage—Preserve Extract of Ox Bile in tight containers.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

EXTRACTUM GLYCYRRHIZÆ

Extract of Glycyrrhiza

Ext. Glycyrrh.—Extract of Licorice Root, Licorice

A commercial Extract of Glycyrrhiza prepared from the rhizome and roots of species of *Glycyrrhiza* (Fam. *Leguminosæ*).

Description—Extract of Glycyrrhiza occurs as a brown powder, in flattened, cylindrical rolls, or in masses. The rolls or masses have a glossy black color externally, and a brittle, sharp, smooth, conchoidal fracture. The Extract has a characteristic and sweet taste which is not more than very slightly acid.

Insoluble matter—Not more than 25 per cent of Extract of Glycyrrhiza is insoluble in cold water.

Foreign starch—Prepare a 5 per cent aqueous mixture of Extract of Glycyrrhiza, using cold distilled water. The sediment from this mixture, mounted and examined under a microscope, shows no *foreign starch*.

Ash—Extract of Glycyrrhiza yields not more than 5 per cent of ash, page 556.

Storage—Preserve Extract of Glycyrrhiza in well-closed containers.

EXTRACTUM GLYCYRRHIZÆ PURUM

Pure Extract of Glycyrrhiza

Ext. Glycyrrh. Pur.—Pure Extract of Licorice Root

Moisten 1000 Gm. of glycyrrhiza, in granular powder, with boiling water, transfer it to a percolator, and percolate with boiling water until the glycyrrhiza is exhausted. Add enough solution of ammonia to the percolate to impart a distinctly ammoniacal odor, then boil the liquid under normal pressure until it is reduced to a volume of about 1500 cc. Filter the liquid, and immediately evaporate the filtrate until the residue has a pilular consistence.

Description—Pure Extract of Glycyrrhiza is a black, pilular mass having a characteristic, sweet taste.

Storage—Preserve Pure Extract of Glycyrrhiza in well-closed containers.

EXTRACTUM HEPATIS

Extract of Liver

Ext. Hepat.—Dry Liver Extract

Extract of Liver is a dry, brownish, somewhat hygroscopic powder, and contains that soluble thermostable fraction of mammalian livers

which increases the number of red blood corpuscles in the blood of persons suffering from pernicious anemia. The approximate anti-anemic potency of Extract of Liver in pernicious anemia shall be expressed in U. S. P. Units and shall conform to all other provisions outlined under *Anti-anemia Preparations*, page 553.

Storage—Preserve Extract of Liver in well-closed containers, preferably at a temperature not above 20° C.

U. S. P. Products of Extract of Liver—Injectio Hepatis, Liquor Hepatis.

AVERAGE DAILY DOSE—One U. S. P. Unit.

EXTRACTUM HYOSCYAMI

Extract of Hyoscyamus

Ext. Hyosc.—Extract of Henbane, Extractum Hyoscyami P.I.

Extract of Hyoscyamus yields, from each 100 Gm., not less than 0.135 Gm. and not more than 0.175 Gm. of the alkaloids of hyoscyamus.

PILULAR EXTRACT OF HYOSCYAMUS

Prepare an extract by percolating 1000 Gm. of hyoscyamus, in moderately coarse powder, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug during 16 hours, and then percolate it at a moderate rate. Evaporate the percolate to a pilular consistence under reduced pressure and at a temperature not exceeding 60° C., and adjust the remaining extract, after assaying, by dilution with liquid glucose, so that the finished Extract will contain, in each 100 Gm., 0.155 Gm. of the alkaloids of hyoscyamus.

Assay—Weigh accurately 5 Gm. of Pilular Extract of Hyoscyamus, and mix it with a suitable quantity of an absorbent (see *Proximate Assays*, page 605). Transfer the mixture completely, with the aid of a few cc. of alcohol or ether, to an extraction thimble, insert the thimble in a Soxhlet or similar extractor, moisten with a mixture of 3 cc. of stronger ammonia T.S., 5 cc. of alcohol, and 10 cc. of ether, and mix thoroughly. Macerate the mixture over night, and extract it for not less than 3 hours or until completely extracted (see *Extraction of Drugs*, page 603), using ether as the solvent. Then proceed as directed under the *Assay of Hyoscyamus*, page 218, beginning with the words, "Transfer the liquid to a separator . . .". Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of hyoscyamus.

POWDERED EXTRACT OF HYOSCYAMUS

Prepare an extract by percolating 1000 Gm. of hyoscyamus, in moderately coarse powder, using alcohol as the menstruum. Macerate the drug during 16 hours, and then percolate it slowly. Evaporate the percolate to a soft extract under reduced pressure and at a temperature not exceeding 60° C., add 50 Gm. of dry starch, continue the evapora-

tion at the same temperature until the product is dry, and powder the residue. The Extract may be deprived of its fat by treating either the soft extract first obtained, or the dry and powdered extract, as directed under *Extracta*, page 175.

Assay the powdered residue and add sufficient starch, dried at 100° C., to make the finished Extract contain, in each 100 Gm., 0.155 Gm. of the alkaloids of hyoscyamus.

Mix the powders thoroughly and pass the Extract through a fine sieve.

Assay.—Weigh accurately about 5 Gm. of Powdered Extract of Hyoscyamus, place it in an extraction thimble, insert the thimble in a Soxhlet or similar extractor, moisten the extract with a mixture of 3 cc. of stronger ammonia T.S., 5 cc. of alcohol, and 10 cc. of ether, and mix thoroughly. Macerate the mixture over night, and extract it for not less than 3 hours or until completely extracted (see *Extraction of Drugs*, page 603), using ether as the solvent. Then proceed as directed under the *Assay of Hyoscyamus*, page 218, beginning with the words "Transfer the liquid to a separator . . .". Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of hyoscyamus.

Storage.—Preserve Extract of Hyoscyamus in well-closed containers.

AVERAGE DOSE—Metric, 50 mg.—Apothecaries, $\frac{3}{4}$ grain.

EXTRACTUM MALTI

Extract of Malt

Ext. Malt.

Extract of Malt is a product obtained by extracting malt, the partially and artificially germinated grain of one or more varieties of *Hordeum vulgare* Linné (Fam. *Gramineæ*). The malt is infused with water at 60° C., the expressed liquid concentrated at a temperature not exceeding 60° C., and the extract mixed with 10 per cent, by weight, of glycerin. It contains dextrin, maltose, a small amount of glucose, and amylolytic enzymes.

Extract of Malt is capable of converting not less than 5 times its weight of starch into water-soluble sugars.

Description.—Extract of Malt is a sweet, viscous, light brown, liquid extract having an agreeable, characteristic odor.

Solubility.—Extract of Malt is for the most part soluble in cold water, but is more readily soluble in warm water. Its aqueous solution is not clear and deposits a voluminous, flocculent precipitate upon standing.

Specific gravity.—The specific gravity of Extract of Malt is not less than 1.350 and not more than 1.430 at 25° C.

Assay.—Mix a quantity of potato starch, in which the moisture has been determined as directed under *Pancreatinum*, page 347, equivalent to 5 Gm. of dried starch, in a beaker, with 10 cc. of cold distilled water. Add 140 cc. of boiling distilled water, and heat on a water bath, with constant stirring, for 2 minutes or until a trans-

lucent, uniform paste is obtained. Cool to 40° C. in a suitable bath previously adjusted to this temperature. Add 20 cc. of a fresh solution of Extract of Malt having a temperature of 40° C., prepared by dissolving 5 Gm. of Extract of Malt in sufficient distilled water to make 100 cc. of solution at 40° C. Mix this well, and maintain the same temperature for exactly 30 minutes, stirring frequently. A thin, clear liquid is produced. Stir, and add at once 0.1 cc. of this liquid to a previously made mixture of 0.2 cc. of tenth-normal iodine and 60 cc. of distilled water: no blue or reddish color develops.

Storage—Preserve Extract of Malt in well-closed containers which have been sterilized prior to filling.

AVERAGE DOSE—Metric, 15 Gm.—Apothecaries, 4 drachms.

EXTRACTUM PERPOLITIONUM ORYZÆ

Extract of Rice Polishings

Ext. Perpol. Oryz.—Extract of Tikitiki, Extract of Rice Bran, Extracto de Salvado

Extract of Rice Polishings contains, in each cc., not less than 20 U. S. P. Units of Vitamin B₁, and represents approximately 14.5 Gm. of Rice Polishings.

Mix 1000 Gm. of Rice Polishings with 3000 cc. of a mixture of 3 volumes of alcohol and 1 volume of distilled water, and macerate the mixture with occasional stirring during at least 48 hours. Separate the supernatant liquid, and remove as much liquid from the residue as possible by pressure. Filter the liquid, and evaporate it under vacuum at a temperature not exceeding 60° C. to a specific gravity of approximately 1.22. Mix this residue with an equal volume of alcohol, and allow to stand over night. Decant the supernatant liquid, and reject the gummy residue. Filter the liquid, and evaporate under vacuum at a temperature not exceeding 60° C. to an Extract having a specific gravity of approximately 1.32. Heat the Extract to 65° C., and transfer at once to suitable containers, seal, and then heat for 30 minutes at 65° C.

NOTE—Benzoic acid, in an amount not exceeding 0.2 per cent, may be added to this Extract as a preservative.

Description—Extract of Rice Polishings is a dark brown, viscous liquid having the odor of burnt sugar and a sweetish taste.

Solubility—Extract of Rice Polishings is miscible with cold water, but more readily miscible with warm water.

Specific gravity—The specific gravity of Extract of Rice Polishings is between 1.28 and 1.32 at 27.5° C.

Identification—To 1 cc. of an aqueous solution of Extract of Rice Polishings (1 in 10) add 2 cc. of diazotized *p*-amino acetophenone T.S., and let it stand for 1 hour. Add 5 cc. of isobutyl alcohol, shake well, and permit to separate: the isobutyl alcohol layer is colored pink or purple.

Assay for Vitamin B₁—Proceed as directed under *Thiamine Hydrochloride* or *Vitamin B₁ Assay*, page 623.

Storage—Preserve Extract of Rice Polishings in tight containers.

AVERAGE DOSE—Metric, 8 cc.—Apothecaries, 2 fluidrachms.

EXTRACTUM RHEI

Extract of Rhubarb

Ext. Rhei—Powdered Extract of Rhubarb

Each Gm. of Extract of Rhubarb represents 2 Gm. of rhubarb.

Prepare an extract by percolating 1000 Gm. of rhubarb, in moderately coarse powder, using a mixture of 4 volumes of alcohol and 1 volume of water as the menstruum. Macerate the moistened drug during 48 hours, and then percolate it at a moderate rate. Evaporate the percolate to dryness at a temperature not exceeding 70° C. Powder the residue, and add sufficient starch, dried at 100° C., to make the product weigh 500 Gm. Mix thoroughly and pass the Extract through a fine sieve.

AVERAGE DOSE—Metric, 0.5 Gm.—Apothecaries, 7½ grains.

EXTRACTUM STRAMONII

Extract of Stramonium

Ext. Stramon.

Extract of Stramonium yields, from each 100 Gm., not less than 0.90 Gm. and not more than 1.10 Gm. of the alkaloids of stramonium.

PILULAR EXTRACT OF STRAMONIUM

Prepare an extract by percolating 1000 Gm. of stramonium, in moderately coarse powder, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug during 16 hours, and then percolate it at a moderate rate. Evaporate the percolate to a pilular consistence under reduced pressure and at a temperature not exceeding 60° C., and adjust the remaining extract, after assaying, by dilution with liquid glucose, so that the finished Extract will contain, in each 100 Gm., 1.00 Gm. of the alkaloids of stramonium.

Assay—Proceed as directed under the *Assay of Pilular Extract of Hyoscyamus*, page 179, using approximately 3 Gm. of Pilular Extract of Stramonium, accurately weighed. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of stramonium.

POWDERED EXTRACT OF STRAMONIUM

Prepare an extract by percolating 1000 Gm. of stramonium, in

moderately coarse powder, using alcohol as the menstruum. Macerate the drug during 16 hours, and then percolate it slowly. Evaporate the percolate to a soft extract, under reduced pressure and at a temperature not exceeding 60° C., add 50 Gm. of dry starch, continue the evaporation, at the same temperature, until the product is dry, and powder the residue. The extract may be deprived of its fat by treating either the soft extract first obtained, or the dry and powdered extract, as directed under *Extracta*, page 175.

Assay the powdered residue, and add sufficient starch, dried at 100° C., to make the finished Extract contain, in each 100 Gm., 1.00 Gm. of the alkaloids of stramonium.

Mix the powders thoroughly and pass the Extract through a fine sieve.

Assay—Proceed as directed under the *Assay of Powdered Extract of Hyoscyamus*, page 180, using approximately 3 Gm. of Powdered Extract of Stramonium, accurately weighed. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of stramonium.

Storage—Preserve Extract of Stramonium in well-closed containers.

AVERAGE DOSE—Metric, 20 mg.—Apothecaries, $\frac{1}{3}$ grain.

FEL BOVIS

Ox Bile

Oxgall

Ox Bile is the fresh bile of the ox, *Bos taurus* Linné (Fam. *Bovidæ*).

Description—Ox Bile is a brownish green or dark green, somewhat viscid liquid having a characteristic odor, and a disagreeable, bitter taste. A frothy mixture is produced when Ox Bile is shaken with water.

Specific gravity—The specific gravity of Ox Bile is not less than 1.015 and not more than 1.025 at 25° C.

Identification—Mix 2 drops of Ox Bile with 10 cc. of water and a drop of a freshly prepared solution of 1 part of sucrose in 4 parts of water, and cautiously add sulfuric acid until the precipitate first formed is redissolved. The mixture gradually acquires a brownish red color, which changes successively to carmine, purple, and violet.

Reaction—Ox Bile is neutral or faintly alkaline to litmus paper.

U. S. P. Products of Ox Bile—Extractum Fellis Bovis, Tabellæ Extracti Fellis Bovis.

FERRI ET AMMONII CITRATES

Iron and Ammonium Citrates

Ferr. et Ammon. Cit.

Iron and Ammonium Citrates contains ferric citrate equivalent to not less than 16.5 per cent and not more than 18.5 per cent of Fe.

Description—Iron and Ammonium Citrates occurs as thin, transparent, garnet red scales or granules, or as a brownish yellow powder. It is odorless, and has a saline, mildly ferruginous taste. It is deliquescent in air and is affected by light.

Solubility—Iron and Ammonium Citrates is very soluble in water. It is insoluble in alcohol.

Identification—

- A: When strongly heated, Iron and Ammonium Citrates chars, and finally leaves a residue of ferric oxide.
- B: Ammonia T.S. added to an aqueous solution of Iron and Ammonium Citrates (1 in 100) produces no precipitate, but darkens the solution.
- C: To 5 cc. of a solution of Iron and Ammonium Citrates (1 in 100) add 0.3 cc. of potassium permanganate T.S. and 4 cc. of mercuric sulfate T.S., and heat the mixture to boiling: a white precipitate is produced.
- D: Remove the iron from 10 cc. of an aqueous solution of Iron and Ammonium Citrates (1 in 10) by boiling it with an excess of potassium hydroxide T.S., filter, and then slightly acidulate 4 cc. of the filtrate with acetic acid: a portion of the cooled filtrate, when mixed with 2 cc. of calcium chloride T.S., and again heated to boiling, gradually deposits a white, crystalline precipitate.

Reaction—An aqueous solution of Iron and Ammonium Citrates (1 in 20) is neutral or only slightly acid or alkaline to litmus paper.

Tartrate—The remainder of the filtrate obtained in *identification test D*, when acidified more strongly with acetic acid and allowed to stand for 24 hours, does not yield a white, crystalline precipitate.

Ferric citrate—An aqueous solution of Iron and Ammonium Citrates (1 in 100) does not yield a blue precipitate with potassium ferrocyanide T.S. unless it has been previously acidified with hydrochloric acid.

Assay—Weigh accurately about 1 Gm. of Iron and Ammonium Citrates, dissolve it in 25 cc. of distilled water in a glass-stoppered flask, add 5 cc. of hydrochloric acid and 4 Gm. of potassium iodide, stopper the flask, and allow it to stand for 15 minutes in the dark. Dilute with 100 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.005585 Gm. of Fe.

Storage—Preserve Iron and Ammonium Citrates in tight, light-resistant containers.

U. S. P. Product of Iron and Ammonium Citrates—*Capsulæ Ferri et Ammonii Citratum*.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

FERRI ET AMMONII CITRATES VIRIDES

Green Iron and Ammonium Citrates

Ferr. et Ammon. Cit. Virid.

Green Iron and Ammonium Citrates contains ferric citrate equivalent to not less than 14.5 per cent and not more than 16 per cent of Fe.

Description—Green Iron and Ammonium Citrates occurs as thin, transparent, green scales, granules or as a powder. It is odorless, and has a saline, mildly ferruginous taste. It is deliquescent in air and is affected by light.

Solubility—Green Iron and Ammonium Citrates is very soluble in water. It is insoluble in alcohol.

Identification—

- A: Heat about 0.1 Gm. of Green Iron and Ammonium Citrates with about 5 cc. of potassium hydroxide T.S.: a brownish red precipitate is produced and ammonia is evolved.
- B: Ammonia T.S. added to an aqueous solution of Green Iron and Ammonium Citrates (1 in 100) produces no precipitate, but the greenish yellow color changes to yellow or light brown, the color darkening upon standing.
- C: To 5 cc. of a solution of Green Iron and Ammonium Citrates (1 in 100) add 0.3 cc. of potassium permanganate T.S. and 4 cc. of mercuric sulfate T.S., and heat the mixture to boiling: a white precipitate is produced.

Reaction—An aqueous solution of Green Iron and Ammonium Citrates (1 in 20) is acid to litmus paper.

Other tests—Green Iron and Ammonium Citrates meets the requirements of *identification test D* and the test for *tartrate*, under *Ferri et Ammonii Citrates*, page 184.

Assay—Proceed as directed under *Ferri et Ammonii Citrates*, page 184. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.005585 Gm. of Fe.

Storage—Preserve Green Iron and Ammonium Citrates in tight containers, protected from light.

AVERAGE DOSE—Intramuscular, Metric, 60 mg.—Apothecaries, 1 grain.

FERRI SULFAS

Ferrous Sulfate

Ferr. Sulf.—Iron Sulfate

$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

Mol. wt. 278.02

Ferrous Sulfate contains not less than 54.36 and not more than 57.07 per cent of anhydrous ferrous sulfate (FeSO_4), corresponding to not less than 99.5 per cent of the hydrated salt ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$).

Description—Ferrous Sulfate occurs as pale, bluish green crystals or granules. It is odorless, has a saline, styptic taste, and is efflorescent in dry air. On exposure to moist air, the crystals rapidly oxidize and become coated with brownish yellow basic ferric sulfate. When Ferrous Sulfate has thus deteriorated, it must not be used for any official or medicinal purpose.

Solubility—One Gm. of Ferrous Sulfate dissolves in 1.5 cc. of water at 25° C. and in 0.5 cc. of boiling water. It is insoluble in alcohol.

Identification—Ferrous Sulfate responds to the tests for ferrous salts, page 590, and for sulfate, page 592.

Reaction—An aqueous solution of Ferrous Sulfate (1 in 20) is acid to litmus paper.

Free acid—Agitate 1 Gm. of Ferrous Sulfate, in small fragments, during 5 minutes with 10 cc. of alcohol, and filter the mixture: the filtrate does not immediately redden moistened blue litmus paper.

Copper and lead—Dissolve 0.5 Gm. of Ferrous Sulfate in 40 cc. of recently boiled, cooled distilled water, add 1 cc. of diluted sulfuric acid, and dilute to 50 cc. with recently boiled, cooled distilled water. Divide the solution into 2 equal portions and place in suitable comparator tubes. To one portion, "A," add 10 cc. of hydrogen sulfide T.S., and mix; to the other portion, "B," add 10 cc. of distilled water: after 5 minutes when viewed downward over a white surface, "A" shows no darker coloration than "B."

Assay—Dissolve about 1 Gm. of Ferrous Sulfate, accurately weighed, in 25 cc. of diluted sulfuric acid and 25 cc. of distilled water, and titrate with tenth-normal

potassium permanganate until a permanent pink color is produced. Each cc. of tenth-normal potassium permanganate is equivalent to 0.01519 Gm. of FeSO_4 .
Storage—Preserve Ferrous Sulfate in tight containers.

U. S. P. Products of Ferrous Sulfate—*Ferri Sulfas Exsiccatus*, *Tabellæ Ferri Sulfatis*.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

FERRI SULFAS EXSICCATUS

Exsiccated Ferrous Sulfate

Ferr. Sulf. Exsic.—Dried Ferrous Sulfate

Exsiccated Ferrous Sulfate contains not less than 80 per cent of anhydrous ferrous sulfate (FeSO_4).

Description—Exsiccated Ferrous Sulfate is a grayish white powder.

Solubility—Exsiccated Ferrous Sulfate dissolves slowly in water. It is insoluble in alcohol.

Identification—Exsiccated Ferrous Sulfate shows the reactions and meets the requirements of the tests under *Ferri Sulfas*, page 185, except the test for *free acid*, allowance being made for the difference in water content.

Insoluble matter—A solution of Exsiccated Ferrous Sulfate (1 in 20) in recently boiled and cooled distilled water is not more than slightly turbid.

Assay—Dissolve about 0.8 Gm. of Exsiccated Ferrous Sulfate, accurately weighed, in 25 cc. of diluted sulfuric acid and 25 cc. of distilled water, and titrate with tenth-normal potassium permanganate until a permanent pink color is produced. Each cc. of tenth-normal potassium permanganate corresponds to 0.01519 Gm. of FeSO_4 .

Storage—Preserve Exsiccated Ferrous Sulfate in well-closed containers.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains

FERRUM REDUCTUM

Reduced Iron

Ferr. Reduct.—Iron by Hydrogen

Fe

At wt. 55.85

Reduced Iron is obtained by the action of hydrogen upon ferric oxide and contains not less than 90 per cent of metallic iron (Fe).

Description—Reduced Iron is an odorless, grayish black powder, all of which must pass through a No. 100 sieve. It is lusterless or has not more than a slight luster. When viewed under a lens having a magnifying power of one hundred diameters, Reduced Iron appears as an amorphous powder, free from particles having a crystalline structure. It is stable in dry air.

Identification—Heat about 1 Gm. of Reduced Iron in a porcelain crucible with a small Bunsen flame until it assumes a bluish black color without glowing, then quickly pour it from the crucible: the particles of iron will glow brightly as they fall through the air.

Insoluble in diluted sulfuric acid—Treat 1 Gm. of Reduced Iron with 20 cc. of diluted sulfuric acid, and when the reaction subsides, heat gently until no more gas is evolved. Filter, wash the residue with distilled water until the washings

cease to react for sulfate, and dry to constant weight at 110° C.: the weight of the residue does not exceed 10 mg.

Reaction—Shake 1 Gm. of Reduced Iron with 5 cc. of distilled water, and filter: the filtrate does not change the color of litmus paper.

Sulfide—One Gm. of Reduced Iron mixed with 20 cc. of diluted sulfuric acid in a flask causes the evolution of hydrogen, which is nearly odorless and does not affect paper moistened with lead acetate T.S. within 2 minutes.

Arsenic—Transfer 0.10 Gm. of Reduced Iron, accurately weighed, to a Gutzeit bottle. Add bromine T.S. (about 10 cc.) in small divided portions until most of the Reduced Iron dissolves and a slight excess of bromine remains. Heat the mixture on a water bath for 15 minutes. Subject the solution to the test for *arsenic*, page 554, reversing the order of the addition of the acid-stannous chloride T.S. and the potassium iodide T.S. This solution meets the requirements of the test for *arsenic*, page 554.

Lead—Reduced Iron contains not more than 50 parts per million of lead, page 593.

Assay—Triturate thoroughly about 1 Gm. of Reduced Iron, weigh accurately, place it in a 100-cc. volumetric flask, and add 10 Gm. of finely powdered mercury bichloride and 50 cc. of boiling distilled water. Heat the mixture for 10 minutes on a water bath, shaking it frequently, then fill the flask to the 100-cc. mark with recently boiled and cooled distilled water, and cool the mixture to room temperature. Again fill the flask to the mark with distilled water, stopper, agitate the contents well, and allow to stand for a few minutes. Now filter the contents of the flask through a dry filter, rejecting the first 10 cc. of the filtrate, then immediately titrate exactly 20 cc. of the filtrate, to which has been added 20 cc. of diluted sulfuric acid, with tenth-normal potassium permanganate until a permanent pink color is produced. Each cc. of tenth-normal potassium permanganate is equivalent to 0.005585 Gm. of Fe.

Storage—Preserve Reduced Iron in well-closed containers.

AVERAGE DOSE—Metric, 0.5 Gm.—Apothecaries, 7½ grains.

FLUIDEXTRACTA

Fluidextracts

Fluid Extracts

Fluidextracts are liquid preparations of vegetable drugs, containing alcohol as a solvent or as a preservative, or both, and so made that each 1 cc. contains the therapeutic constituents of 1 Gm. of the standard drug which it represents.

The official fluidextracts are made by the process of percolation, the menstruum to be used being specified in each monograph. Manufacture by the usual process calls for concentration of the more diluted portion of percolate by distillation. This should be done in a vacuum distillation apparatus, the temperature in the still being kept below 60° C.

The time of maceration and the rate of flow during percolation are varied for different drugs to compensate for peculiarities in extraction and in some cases to accomplish partial rejection of non-active constituents. In all cases the maceration and rate of flow are designed to

extract completely the medicinally active or important constituents from the specified quantities of drugs; but the time and rate specified may be varied to accomplish this purpose when larger or smaller quantities of drug are being treated.

Usually a cylindrical form of percolator is the best type for making fluidextracts, but for use with drugs which swell considerably in the menstruum a flaring form of percolator may be preferred.

The rate of flow of the percolate is directed in these terms: "percolate slowly," "percolate rapidly," and "percolate at a moderate rate." With reference to the extraction of 1000 Gm. of drug, "percolate slowly" means a rate not exceeding 1 cc. of percolate per minute; "percolate rapidly" means a rate of from 3 to 5 cc. per minute; "percolate at a moderate rate" means a rate of from 1 to 3 cc. per minute.

A fluidextract which may deposit sediment may be aged and filtered or the clear portion decanted, provided the resulting clear liquid conforms to the official standards.

The general processes of manufacture directed by the Pharmacopœia are as follows:

Process A. This process is used for preparing fluidextracts which are made with menstrua of alcohol or with mixtures of alcohol and water, by ordinary percolation.

Carefully mix 1000 Gm. of the ground drug with a sufficient quantity of the prescribed menstruum to render it evenly and distinctly damp. This usually requires from 600 cc. to 800 cc. of menstruum. Allow the dampened drug to stand for about 15 minutes, then pack it firmly in a suitable percolator, and pour on sufficient menstruum to saturate the drug and leave a stratum above. When the liquid is about to drop from the percolator, close the lower orifice, cover the percolator, and allow the drug to macerate for about the prescribed period of time. Then proceed with the percolation at the specified rate, adding fresh menstruum as needed until the drug is exhausted of its active principles. Reserve the first 850 cc. of percolate (unless otherwise directed in the formula), recover the alcohol from the percolate subsequently collected, and concentrate the residue to a soft extract at a temperature not exceeding 60° C. Dissolve this extract in the reserved percolate, and if no assay is directed, add enough of a mixture of alcohol and water to make the fluidextract measure 1000 cc. and contain the required proportion of C_2H_5OH . Mix thoroughly. If the fluidextract being prepared is to be adjusted to a standard, assay a portion of the reserved percolate in which the soft extract has been dissolved, and dilute the re-

mainder to the volume determined as necessary by calculation from the assay, using a sufficient quantity of an alcohol and water mixture to provide the required proportion of C_2H_5OH . Mix thoroughly.

Process B. This process is used in preparing fluidextracts, portions of the menstrua for which contain, in addition to alcohol, or a mixture of alcohol and distilled water, definite quantities of other components such as an acid or glycerin, the two menstrua being successively employed.

Carefully mix 1000 Gm. of the ground drug with a sufficient quantity of Menstruum I (containing the special ingredient) to render it evenly and distinctly damp. From 600 cc. to 800 cc. of menstruum is usually required. Allow the dampened drug to stand for about 15 minutes, then pack it firmly in a suitable percolator, and pour on the remainder of Menstruum I. When the liquid is about to drop from the percolator, close the lower orifice, cover the percolator, and allow the drug to macerate for about the prescribed period of time. Then proceed with the percolation at the specified rate, and when the first menstruum has disappeared from the surface of the drug, use Menstruum II as needed until the drug is exhausted of its active principles. Reserve the first 850 cc. of percolate, recover the alcohol from the percolate subsequently collected, and evaporate the residue to a soft extract at a temperature not exceeding $60^{\circ} C$. Dissolve this extract in the reserved percolate, and if no assay is directed, add enough of a mixture of alcohol and water to make the fluidextract measure 1000 cc. and contain the required proportion of C_2H_5OH . Mix thoroughly. If the fluidextract being prepared is to be adjusted to a standard, assay a portion of the reserved percolate in which the soft extract has been dissolved, and dilute the remainder to the volume determined as necessary by calculation from the assay, using a sufficient quantity of an alcohol and water mixture to prove the required proportion of C_2H_5OH . Mix thoroughly.

Process C. *Fractional or Divided Percolation.*

This process is used for preparing fluidextracts, the constituents of which are injured by heat, or as an alternative for Process A or B, or in case suitable facilities for distillation and concentration are lacking. When Process C is used to prepare a fluidextract directed to be made by Process B, Menstruum I is used throughout the percolation.

Divide 1000 Gm. of the ground drug into three portions, consisting of 500 Gm., 300 Gm., and 200 Gm. Mix the first portion (500 Gm.) with sufficient of the prescribed menstruum to render it evenly and dis-

tinctly damp, transfer the dampened powder to a suitable percolator, the capacity of which should not greatly exceed the bulk of the moist drug when packed firmly, and allow it to stand for about 15 minutes. Then pack the drug in the percolator, saturate it with the menstruum, and allow it to macerate for about the prescribed period of time. Then proceed with the percolation, first collecting and reserving 200 cc. of percolate, and afterwards collecting five successive portions of percolate of 300 cc. each, numbering them in the order in which they are obtained.

Dampen the second portion (300 Gm.) of the drug with a sufficient quantity of the first of the 300-cc. portions of percolate from the preceding lot of drug, and carry out the percolation as just directed for the first lot, except that the five 300-cc. portions of percolate from the first lot of drug shall first be used as menstruum in the order in which they were received, followed, if necessary, by sufficient fresh menstruum to supply the following portions of percolate: reserve the first 300 cc. of percolate, and then collect five successive portions of 200 cc. each, numbering them in the order in which they are collected.

Now dampen the third portion (200 Gm.) of the drug with a sufficient quantity of the first numbered portion of percolate from the second lot of drug, and proceed with the percolation as before, using as the menstruum the 200-cc. portions of percolate from the second lot of drug in the order received. If no assay is directed, collect and reserve 500 cc. of percolate. Mix the three reserved percolates from the three lots of drug to make 1000 cc. of fluidextract.

If the fluidextract being prepared by Process C is to be adjusted to a standard, collect and reserve only 420 cc. of percolate from the third portion of drug instead of the 500 cc. directed above. Mix the three reserved percolates from the three lots of drug, and assay a portion of the mixture. Dilute the remainder to the volume determined as necessary by calculation from the assay, using a sufficient quantity of an alcohol and water mixture to provide the required proportion of C_2H_5OH . Mix thoroughly.

Process D. This process is used for preparing fluidextracts with boiling distilled water as the menstruum, alcohol being added as a preservative to the concentrated percolate.

To 1000 Gm. of the coarsely ground drug add about 3000 cc. of boiling distilled water, mix well, and allow it to macerate in a suitable, covered metallic percolator for 2 hours. Then allow the percolation to proceed at the specified rate, gradually adding boiling distilled water until the drug is exhausted. Evaporate the percolate on a water bath to the

volume specified, cool, add the alcohol, and allow the mixture to stand in a stoppered container for several days. Then decant the clear liquid, filter the remainder into the decanted liquid, and wash the residue on the filter with a sufficient quantity of a mixture of alcohol and distilled water to make the fluidextract measure 1000 cc. and contain the required proportion of C_2H_5OH . Mix thoroughly.

Storage—Preserve Fluidextracts in tight, light-resistant containers and avoid exposure to direct sunlight or to excessive heat.

FLUIDEXTRACTUM CASCARÆ SAGRADÆ

Fluidextract of Cascara Sagrada

Fidext. Casc. Sagr.—Fluidextract of *Rhamnus Purshiana*

CASCARA SAGRADA, in very coarse powder 1000 Gm.

Prepare a fluidextract by Process D, page 190. Evaporate the aqueous percolate until it measures 800 cc., and when it is cold, gradually add 200 cc. of alcohol and, if necessary, sufficient water to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 17 to 19 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

FLUIDEXTRACTUM CASCARÆ SAGRADÆ AROMATICUM

Aromatic Fluidextract of Cascara Sagrada

Fidext. Casc. Sagr. Arom.—Aromatic Fluidextract of *Rhamnus Purshiana*

CASCARA SAGRADA, in very coarse powder.....	1000	Gm.
MAGNESIUM OXIDE.....	120	Gm.
PURE EXTRACT OF GLYCYRRHIZA.....	40	Gm.
SACCHARIN.....	2	Gm.
OIL OF ANISE.....	0.65	cc.
OIL OF CORIANDER.....	0.15	cc.
METHYL SALICYLATE.....	0.1	cc.
ALCOHOL.....	200	cc.
WATER, a sufficient quantity,		
To make.....	1000	cc.

Thoroughly mix the cascara sagrada with the magnesium oxide, moisten it uniformly with 2000 cc. of boiling water, and set it aside in a shallow container for 48 hours, stirring it occasionally. Pack it in a percolator, and percolate with boiling water until the drug is exhausted. Evaporate the percolate, at a temperature not exceeding 100° C., to 750 cc., and at once dissolve in it the pure extract of glycyrrhiza. When the liquid has cooled, add the alcohol, in which the saccharin, methyl salicylate, and oils have been dissolved, and finally sufficient water to make the Fluidextract measure 1000 cc. Mix thoroughly.

Alcohol content—From 17 to 19 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

FLUIDEXTRACTUM ERGOTÆ

Fluidextract of Ergot

Fidext. Ergot.—Extractum secalis cornuti fluidum acidum P.I.

ERGOT, recently ground and in coarse powder. 1000 Gm.

PURIFIED PETROLEUM BENZIN, a sufficient quantity.

Pack the ergot in a cylindrical percolator, and slowly percolate with purified petroleum benzin until a few drops of the percolate last collected leave no greasy stain when evaporated from filter paper. Reject the benzin solution, remove the drug from the percolator, and dry by exposure to the air. Then make a fluidextract by Process C, page 189, using a menstruum consisting of 2 volumes of hydrochloric acid and 98 volumes of diluted alcohol, macerating during 48 hours and obtaining 1000 cc. of finished Fluidextract.

This Fluidextract may also be prepared as follows:

Prepare a Fluidextract by Process C, page 189, using a menstruum consisting of 2 volumes of hydrochloric acid and 98 volumes of diluted alcohol. Chill the 1000 cc. of combined reserve percolates to $-14^{\circ}C$., and remove the congealed fat by filtration, maintaining the temperature at $-14^{\circ}C$. Finally add sufficient of the original menstruum to make the finished Fluidextract measure 1000 cc.

Alcohol content—From 37 to 42 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

FLUIDEXTRACTUM ERIODICTYI**Fluidextract of Eriodictyon****Fldext. Eriodict.**—Fluidextract of Yerba Santa**ERIODICTYON**, in moderately coarse powder..... 1000 Gm.

Prepare a fluidextract by Process A, page 188, using a mixture of 4 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug during 48 hours, then percolate at a moderate rate, and reserve the first 800 cc. of percolate.

Alcohol content—From 57 to 62 per cent, by volume, of C_2H_5OH .**AVERAGE DOSE**—Metric, 1 cc.—Apothecaries, 15 minims.**FLUIDEXTRACTUM GLYCYRRHIZÆ****Fluidextract of Glycyrrhiza****Fldext. Glycyrrh.**—Fluidextract of Licorice Root**GLYCYRRHIZA**, in very coarse powder..... 1000 Gm.

Prepare a fluidextract by Process D, page 190, percolating at a moderate rate. Add enough ammonia water to the aqueous percolate to impart a distinctly ammoniacal odor, then boil the liquid actively under normal atmospheric pressure until it is reduced to a volume of about 1500 cc. Filter the liquid, evaporate the filtrate on a water bath until the residue measures 750 cc., and gradually add 250 cc. of alcohol and enough water to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 20 to 24 per cent, by volume, of C_2H_5OH .**AVERAGE DOSE**—Metric, 2 cc.—Apothecaries, 30 minims.**FLUIDEXTRACTUM IPECACUANHÆ****Fluidextract of Ipecac****Fldext. Ipecac.**

Fluidextract of Ipecac yields, from each 100 cc., not less than 1.8 Gm. and not more than 2.2 Gm. of the ether-soluble alkaloids of ipecac.

IPECAC, in fine powder..... 1000 Gm.

Exhaust the ipecac by percolation, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum, macerating for 72 hours and percolating slowly. Reduce the entire percolate to a volume of 1000 cc. by evaporation at a temperature not exceeding 60° C., and add 2000 cc. of water. Allow the mixture to stand over night, filter, and evaporate the filtrate to a volume of 565 cc. To this add 35 cc. of hydrochloric acid and 300 cc. of alcohol, mix well, and filter.

Assay a portion of this liquid, and dilute the remainder with a mixture of 30 volumes of alcohol, 3.5 volumes of hydrochloric acid, and 66.5 volumes of water to make each 100 cc. of the Fluidextract contain 2.0 Gm. of the ether-soluble alkaloids of ipecac.

Assay—Measure accurately 10 cc. of Fluidextract of Ipecac, and transfer it to an evaporating dish containing either absorbent paper or asbestos, and dry at a temperature not exceeding 60° C. Transfer the absorbent to a flask containing 100 cc. of peroxide-free ether, measured at 25° C., stopper the flask tightly, shake well, and allow the mixture to stand for 5 minutes. Then add 10 cc. of ammonia T.S., using a portion of the ammonia T.S. to rinse traces of the absorbent from the evaporating dish. Stopper the flask tightly, shake it for 1 hour in a mechanical shaker or intermittently during 2 hours, and allow it to stand overnight at a temperature not exceeding 25°. Again shake the mixture intermittently during 30 minutes, and allow the absorbent to settle at 25° C. Then quickly transfer to a separator exactly 50 cc. of the clear supernatant liquid, representing 5 cc. of the Fluidextract, and proceed as directed under the *Assay of Ipecacuanha*, page 253, beginning with the words “rinse the measuring vessel with a small volume of ether.” Each cc. of tenth-normal sulfuric acid is equivalent to 0.0240 Gm. of the ether-soluble alkaloids of ipecac.

Alcohol content—From 28 to 33 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Emetic—Metric, 0.5 cc.—Apothecaries, 8 minims.

FLUIDEXTRACTUM SARSAPARILLÆ

Fluidextract of Sarsaparilla

Fldext. Sarsap.

SARSAPARILLA, in very coarse powder 1000 Gm.

Prepare a fluidextract by Process A, page 188, using diluted alcohol as the menstruum. Macerate the drug during 48 hours and percolate at a moderate rate.

Alcohol content—From 37 to 42 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

FLUIDEXTRACTUM SENNAE**Fluidextract of Senna****Fldext. Senn.**

SENNA, in coarse powder..... 1000 Gm.

Prepare a fluidextract by Process A, page 188, using a mixture of 1 volume of alcohol and 2 volumes of water as the menstruum. Macerate the drug for 24 hours, then percolate at a moderate rate, and reserve the first 800 cc. of percolate.

Alcohol content—From 23 to 27 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

FLUIDEXTRACTUM ZINGIBERIS**Fluidextract of Ginger****Fldext. Zingib.**

Fluidextract of Ginger yields, from each 100 cc., not less than 4.5 Gm. of ether-soluble extractive.

GINGER, in moderately coarse powder..... 1000 Gm.

Prepare a fluidextract by Process A, page 188, using a mixture of 9 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug over night, and percolate at a moderate rate.

Assay—Place 20 cc. of Fluidextract of Ginger in a 200-cc. beaker, and evaporate on a water bath until there is no longer any odor of alcohol. Remove the beaker from the bath, and add 50 cc. of ether. Stir the contents of the beaker with a stirring rod to dissolve the soluble resin, and decant the ether through a dry, 9-cm. filter into a tared, 200-cc. beaker. Repeat the extraction two or three times, using 50-cc. portions of ether. Finally wash the filter with a small amount of ether, and evaporate the combined ether extracts on a water bath until the odor of ether is no longer perceptible. Place the beaker in a desiccator for 18 hours, and then weigh. The weight of the residue is not less than 0.90 Gm.

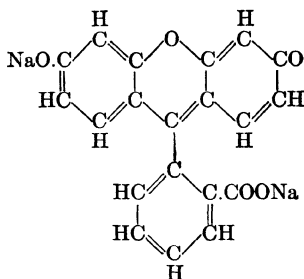
Alcohol content—From 69 to 76 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 0.6 cc.—Apothecaries, 10 minims.

FLUORESC EINUM SODICUM

Fluorescein Sodium

Fluoresc. Sod.—Fluoresceinum Solubile U. S. P. XI, Soluble Fluorescein, Resorcinol-phthalein Sodium



$C_{20}H_{10}O_5Na_2$

Mol. wt. 376.27

Description—Fluorescein Sodium is an orange red powder, odorless, and almost tasteless.

Solubility—Fluorescein Sodium is freely soluble in water and sparingly soluble in alcohol.

Identification—

- A: An aqueous solution of Fluorescein Sodium is strongly fluorescent, even in extreme dilution; the fluorescence disappears when the solution is made acid, and reappears when the solution is again made alkaline.
- B: The residue remaining after the incineration of Fluorescein Sodium responds to the tests for sodium, page 592.
- C: Place 1 drop of an aqueous solution of Fluorescein Sodium (1 in 2000) upon a piece of filter paper: a yellow spot is produced, which, when exposed while moist to the vapor of bromine for 1 minute and then to ammonia vapor, becomes deep pink in color.

Loss on drying—When dried to constant weight at 105° C., Fluorescein Sodium loses not more than 5 per cent of its weight.

Chloride—Dissolve 0.1 Gm. of Fluorescein Sodium in 40 cc. of distilled water, add 2 cc. of nitric acid, allow the mixture to stand for 5 minutes, and filter. Dilute the filtrate to 50 cc. with distilled water, and add 1 cc. of silver nitrate T.S.: the turbidity produced, if any, does not exceed that produced by adding the same volume of silver nitrate T.S. to a mixture of 0.5 cc. of fiftieth-normal hydrochloric acid and 2 cc. of nitric acid diluted to 50 cc. with distilled water, page 626.

Sulfate—Dissolve 0.1 Gm. of Fluorescein Sodium in 40 cc. of distilled water, add 2 cc. of diluted hydrochloric acid, allow it to stand for 5 minutes, and filter. Dilute the filtrate to 50 cc. with distilled water, and add 2 cc. of barium chloride T.S.: the turbidity produced, if any, does not exceed that produced by adding the same volume of barium chloride T.S. to a mixture of 1 cc. of fiftieth-normal sulfuric acid and 1 cc. of diluted hydrochloric acid diluted to 50 cc. with distilled water, page 626.

Zinc—Dissolve 0.1 Gm. of Fluorescein Sodium in 10 cc. of distilled water, add 2 cc. of diluted hydrochloric acid, filter, and add 1 cc. of potassium ferrocyanide T.S. to the filtrate: no turbidity is produced.

Acridine—Dissolve 10 mg. of Fluorescein Sodium in 5 cc. of distilled water, and add a few drops of an aqueous solution of sodium salicylate (1 in 10): no precipitate appears in the mixture.

Storage—Preserve Fluorescein Sodium in tight containers.

GELATINUM

Gelatin

Gelat.

Gelatin is a product obtained by the partial hydrolysis of collagen, derived from the skin, white connective tissue, and bones of animals. Gelatin derived from an acid-treated precursor, exhibits an isoelectric point between pH 7 and pH 9, while Gelatin derived from an alkali-treated precursor has an isoelectric point between pH 4.7 and pH 5.0.

Description—Gelatin occurs in sheets, flakes, shreds, or as a coarse or fine powder. It is white or yellowish, and has a very slight, characteristic bouillon-like odor and taste. It is stable in air when dry, but is subject to microbial decomposition when moist or in solution.

Solubility—Gelatin is insoluble in cold water, but swells and softens when immersed in it, gradually absorbing from 5 to 10 times its own weight of water. It is soluble in hot water, in acetic acid, and in a hot mixture of glycerin and water. It is insoluble in alcohol, in chloroform, in ether, and in fixed and volatile oils.

Identification—

A: An aqueous solution of Gelatin (1 in 100) yields a precipitate with an aqueous solution of chromium trioxide, and with trinitrophenol T.S.

B: An aqueous solution of Gelatin (1 in 5000) is at once rendered turbid by the addition of tannic acid T.S.

Ash—Incinerate 1 Gm. of Gelatin without the use of sulfuric acid: the weight of the residue does not exceed 20 mg.

Odor and water-insoluble substances—A hot solution of Gelatin in distilled water (1 in 40) is free from any disagreeable odor, and when viewed in a layer 2 cm. thick is only slightly opalescent.

Sulfite—Dissolve 20 Gm. of Gelatin in 150 cc. of hot distilled water in a flask having a round bottom and a long neck, add 5 cc. of phosphoric acid and 1 Gm. of sodium bicarbonate, and at once connect the flask with a condenser. Distil 50 cc., receiving the distillate under the surface of 50 cc. of tenth-normal iodine. Acidulate the distillate with a few drops of hydrochloric acid, add 2 cc. of barium chloride T.S., and heat on a water bath until the liquid is nearly colorless. The precipitate of barium sulfate, if any, when filtered, washed, and ignited, weighs not more than 3 mg., corresponding to not more than 0.004 per cent of *sulfur dioxide*, correction being made for any sulfate which may be present in 50 cc. of the tenth-normal iodine.

Arsenic—Heat 15 Gm. of Gelatin with 60 cc. of dilute, arsenic-free hydrochloric acid (1 in 4) in a covered flask until all insoluble matter is flocculated and the Gelatin dissolved. Add an excess of bromine T.S. (about 15 cc.), neutralize with ammonia T.S., add 1.5 Gm. of sodium phosphate, and allow to cool. Add a slight excess (about 30 cc.) of magnesia mixture T.S., allow to stand for 1 hour, filter, and wash with five 10-cc. portions of ammonia T.S. diluted with 3 volumes of distilled water. Drain the precipitate well, and dissolve it in dilute arsenic-free hydrochloric acid (1 in 4) to a volume of exactly 50 cc. Subject 5 cc. of this solution to the test for *arsenic*, page 554. The stain, if any, is not more intense than that produced in a test made with similar quantities of the same reagents and 1.5 cc. of the standard arsenic test solution.

Heavy metals—To the residue obtained in the test for *ash* add 2 cc. of hydrochloric acid and 0.5 cc. of nitric acid, and evaporate the mixture to dryness on a steam bath. Add to the residue 1 cc. of normal hydrochloric acid and 15 cc. of distilled water, and warm for a few minutes. Filter, and wash with sufficient distilled water to make the filtrate measure 50 cc. To 25 cc. of the filtrate, add 10 cc. of hydrogen sulfide T.S. The heavy metals limit, page 586, for Gelatin is 50 parts per million.

Gel strength—Place 1 Gm. of Gelatin, accurately weighed, and 99 cc. of distilled water in a 200-cc. flask, allow to stand for 15 minutes, then place the flask in a water bath at 60° C., and swirl occasionally until solution is complete. Transfer 10 cc. of the solution to a test tube having an internal diameter of 12 mm., and place the tube in an ice bath, making certain that the top of the solution is below the level of the ice and water. Place the bath containing the tube in a refrigerator, and maintain it at about 0° C. for 6 hours. When the tube is removed from the bath and inverted, no movement of the gel is observed.

Bacterial content—When examined as directed under *Bacteriological Examination of Gelatin*, page 556, the total bacterial count in Gelatin should not exceed 10,000 per Gm., and *Escherichia coli* must not be present in 10 mg. or less.

NOTE—Gelatin to be used in the manufacture of capsules in which to dispense medicines, or for the coating of pills, may be colored and contain not more than 0.15 per cent of sulfur dioxide and may have a lower gel strength. For the special Gelatin to be used in the preparation of emulsions, see *Emulsa*, page 159.

Storage—Preserve Gelatin in well-closed containers in a dry place.

U. S. P. Product of Gelatin—Gelatinum Glycerinatum.

GELATINUM GLYCERINATUM

Glycerinated Gelatin

Gelat. Glycerin.

GELATIN.....	100 Gm.
GLYCERIN.....	100 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	200 Gm.

Pour upon the gelatin sufficient distilled water to cover it, allow it to stand for 1 hour, pour off the water, and allow the gelatin to drain for a few minutes. Then transfer it to a dish, add the glycerin, and heat on a water bath until the gelatin is dissolved. Strain the solution while hot, transfer it to a tared dish, and heat it on a water bath until the product weighs 200 Gm. When the mass has cooled, cut it into pieces.

Storage—Preserve Glycerinated Gelatin in well-closed containers.

GELATUM ALUMINI HYDROXIDI

Aluminum Hydroxide Gel

Gel. Alum. Hydrox.—Colloidal Aluminum Hydroxide

Aluminum Hydroxide Gel is an aqueous suspension containing the equivalent of not less than 3.6 per cent and not more than 4.4 per cent of Al_2O_3 , chiefly in the form of the hydrous oxide of aluminum.

NOTE—Sufficient oil of peppermint, glycerin, sucrose, or saccharin may be added for flavoring and other purposes. Sodium benzoate in an amount not exceeding 0.5 per cent may be added as a preservative.

Description—Aluminum Hydroxide Gel is a white, viscous suspension, translucent in thin layers, from which small amounts of water may separate on standing.

Identification—A solution of Aluminum Hydroxide Gel in hydrochloric acid responds to the tests for aluminum, page 587.

Reaction—Aluminum Hydroxide Gel affects slightly both red and blue litmus, but does not affect phenolphthalein T.S.

Acid-consuming capacity—Transfer about 1.5 cc. of the well-shaken Aluminum Hydroxide Gel to a tared, 125-cc. glass-stoppered flask, and reweigh. Add 50 cc. of tenth-normal hydrochloric acid, and adjust the temperature of the mixture to 37.5° C. Tightly stopper the flask, and maintain at this temperature for 1 hour. Add 5 drops of bromophenol blue T.S., and titrate the excess acid with tenth-normal sodium hydroxide. Calculate the number of cc. of tenth-normal hydrochloric acid required to neutralize 1 Gm. of the Gel taken for the test. The volume of tenth-normal acid consumed is not less than 12.50 cc. and not more than 25.00 cc. for each Gm. of the Gel.

Chloride—Transfer 10 cc. of Aluminum Hydroxide Gel to a porcelain dish. Add 0.1 cc. of potassium chromate T.S. and 25 cc. of distilled water. Stir, and add tenth-normal silver nitrate until a faint persistent pink color is obtained: it requires not more than 8 cc. of tenth-normal silver nitrate.

Sulfate—Dissolve 5 cc. of Aluminum Hydroxide Gel in 5 cc. of diluted hydrochloric acid with the aid of heat. Cool, and dilute to 250 cc. with distilled water. Mix well, and filter if necessary: a 20-cc. portion of the filtrate shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—To 5 cc. of Aluminum Hydroxide Gel add 10 cc. of diluted sulfuric acid, heat to boiling, then cool. One half of this solution, representing 2.5 cc. of the Gel, meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfurous acid.

Heavy metals—Dissolve 5 cc. of Aluminum Hydroxide Gel in 10 cc. of diluted hydrochloric acid with the aid of heat, and filter if necessary. Dilute to 25 cc. with distilled water. The heavy metals limit, page 586, for Aluminum Hydroxide Gel is 5 parts per million.

Assay—To about 5 Gm. of Aluminum Hydroxide Gel, accurately weighed, add 10 cc. of hydrochloric acid and 100 cc. of distilled water. Heat to boiling, filter if necessary, and add 100 cc. of distilled water, 5 drops of methyl red T.S., and sufficient ammonia T.S. to produce a distinct yellow color in the mixture. Heat to boiling and filter. Wash the precipitate with hot distilled water made slightly alkaline with ammonia T.S. until the filtrate is free from chloride. Dry the precipitate, and ignite to constant weight. The weight of the Al_2O_3 thus obtained corresponds to not less than 3.6 per cent and not more than 4.4 per cent of the weight of the Gel taken for the assay.

Storage—Preserve Aluminum Hydroxide Gel in well-closed containers. It should not be permitted to freeze.

AVERAGE DOSE—Metric, 8 cc.—Apothecaries, 2 fluidrachms.

GELATUM ALUMINI HYDROXIDI SICCU

Dried Aluminum Hydroxide Gel

Gel. Alum. Hydrox. Sic.

Dried Aluminum Hydroxide Gel, when ignited to constant weight, yields not less than 50 per cent of Al_2O_3 .

Description—Dried Aluminum Hydroxide Gel is a white, odorless, tasteless, amorphous powder.

Solubility—Dried Aluminum Hydroxide Gel is insoluble in water and in alcohol. It is soluble in diluted mineral acids and in solutions of fixed alkalies.

Identification—Dissolve 1 Gm. of Dried Aluminum Hydroxide Gel in 10 cc. of diluted hydrochloric acid, by gentle warming: the solution responds to the test for aluminum, page 587.

Reaction—Agitate 1 Gm. of Dried Aluminum Hydroxide Gel with 25 cc. of distilled water, and filter: the filtrate is neutral to litmus paper.

Acid-consuming capacity—Weigh accurately from 0.2 to 0.25 Gm. of Dried Aluminum Hydroxide Gel, and transfer it completely to a 250-cc. flask. Add exactly 100 cc. of tenth-normal hydrochloric acid, and shake the mixture continuously at 37.5° C. for 1 hour. Filter, if necessary, through a dry filter, rejecting the first 10 cc. of the filtrate, then titrate exactly 50 cc. of the subsequent filtrate with tenth-normal sodium hydroxide, using bromophenol blue T.S. as the indicator: the volume of tenth-normal acid used is not less than 250 cc. for each Gm. of Dried Aluminum Hydroxide Gel.

Chloride—Dissolve 1 Gm. of Dried Aluminum Hydroxide Gel in 20 cc. of diluted nitric acid, heat to boiling, add sufficient distilled water to make 100 cc., and filter. A 5-cc. portion of the filtrate, diluted with an equal volume of distilled water and treated with 0.1 cc. of nitric acid and 1 cc. of silver nitrate T.S., shows no more chloride than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Dissolve 1 Gm. of Dried Aluminum Hydroxide Gel in 10 cc. of diluted hydrochloric acid, heat to boiling, add sufficient distilled water, and filter. A 5-cc. portion of the filtrate, diluted with 5 cc. of distilled water and treated with 0.1 cc. of hydrochloric acid and 1 cc. of barium chloride T.S., shows no more sulfate than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Assay—Dissolve about 0.75 Gm. of Dried Aluminum Hydroxide Gel, accurately weighed, by heating with a minimum quantity of diluted hydrochloric acid, add 100 cc. of distilled water, 5 drops of methyl red T.S., and sufficient ammonia T.S. to produce a distinct yellow color in the mixture, heat to boiling, and filter. Wash the precipitate with distilled water, made slightly alkaline with ammonia T.S., until the filtrate is free from chloride. Dry the precipitate, and ignite to constant weight. The weight of Al_2O_3 thus obtained is not less than 50 per cent of the weight of Dried Aluminum Hydroxide Gel taken for the assay.

Storage—Preserve Dried Aluminum Hydroxide Gel in tight containers.

U. S. P. Product of Dried Aluminum Hydroxide Gel—*Gelatum Alumiini Hydroxidi*.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

GENTIANA

Gentian

Gentian.—Gentian Root

Gentian is the dried rhizome and roots of *Gentiana lutea* Linné (Fam. *Gentianaceæ*).

Gentian yields not less than 30 per cent of water-soluble extractive. It contains not more than 15 per cent of moisture, and not more than 2 per cent of foreign organic matter, page 628.

Description—

Unground Gentian—In nearly cylindrical pieces, sometimes branched, entire or longitudinally split, from 5 to 40 mm. in thickness; the rhizome portions annulate from leaf scars and frequently ending in a bud, the rhizome and roots longitudinally wrinkled, sometimes twisted; externally moderate brown to weak brown; brittle when dry, tough and flexible when damp; internally yellowish brown to dusky yellowish orange, with a bark from 0.5 to 2.5 mm. in thickness, separated from a porous wood by a dark cambium zone and radiate in appearance, especially in the region of the cambium; odor strong and characteristic; taste slightly sweet at first, then strongly and persistently bitter.

Histology—Sections of the root exhibit a cork of about 4 to 6 rows of thin-walled cells, a secondary cortex of thin-walled parenchyma, some of the cells of which contain minute acicular crystals and small oil globules, a phloem of many layers of more or less tangentially collapsed parenchyma and numerous strands of sieve tubes, a distinct cambium ring, and a broad xylem consisting of a few large reticulate and scalariform tracheæ and tracheids arranged singly and in small groups and scattered through an abundance of yellowish brown to yellow wood parenchyma; medullary rays indistinct. Sections of the rhizome differ mainly from those of the root in possessing islets of sieve tissue in the xylem, a central pith, and a collenchymatous phelloderm.

Powdered Gentian—Moderate yellowish brown to yellowish orange; consisting chiefly of parenchyma cells containing oil globules, with fragments of reticulate and scalariform tracheæ and tracheids; fragments of cork and collenchyma; occasional clumps of minute prismatic crystals of calcium oxalate in angles of parenchyma cells; starch grains few or absent. Stone cells and fibers are absent.

Identification—Powdered Gentian, when submitted to microsublimation, yields pale, greenish yellow, acicular crystals which are insoluble in water, alcohol, and in ether but soluble in chloral hydrate and potassium hydroxide solutions. The crystals are mostly 10 to 150 microns in length, straight to slightly curved, and isolated or in small clusters.

Moisture—Use the toluene method, page 629.

Assay—Proceed as directed under *water-soluble extractive*, page 632.

U. S. P. Product of Gentian—Tinctura Gentianæ Composita.

GLOBULINUM IMMUNE HUMANUM

Human Immune Globulin

Glob. Immun. Human.—Measles Prophylactic, Placental Extract

Human Immune Globulin is a sterile solution of antibodies obtained from the placenta expelled by healthy women (*Homo sapiens*). Each preparation shall be composed of a pool from at least ten individuals. Human Immune Globulin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Human Immune Globulin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color. It is nearly odorless or has an odor due to the presence of a preservative; it may have a slight, granular deposit. Human Immune Globulin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or not more than 0.4 per cent of cresol if either of these is used).

Regulations—The outside label must bear the name *Human Immune Globulin*, the manufacturer's lot number of the Globulin, the name, address, and license number of the manufacturer, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained.

Storage—Preserve Human Immune Globulin at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intramuscular,

Metric	Apothecaries
For Modification, 2 to 5 cc.—30 to 75 minims.	
For Prevention, 2 to 10 cc.—30 to 150 minims.	

GLUCOSUM LIQUIDUM

Liquid Glucose

Glucos. Liq.—Glucosum U. S. P. XI, Glucose U. S. P. XI

Liquid Glucose is a product obtained by the incomplete hydrolysis of starch. It consists chiefly of dextrose (*d*-glucose, $C_6H_{12}O_6$), dextrans, maltose, and water.

Description—Liquid Glucose is a colorless or yellowish, thick, syrupy liquid. It is odorless, or nearly so, and has a sweet taste.

Solubility—Liquid Glucose is very soluble in water, but is sparingly soluble in alcohol.

Identification—Add a few drops of an aqueous solution of Liquid Glucose (1 in 20) to 5 cc. of hot alkaline cupric tartrate T.S.: a copious, red precipitate of cuprous oxide appears (distinction from *sucrose*).

Loss on drying—Introduce about 0.5 Gm. of Liquid Glucose into a wide-mouthed, tared, weighing-bottle, weigh accurately, add 2 cc. of distilled water, evaporate at about 70° C., and dry the residue to constant weight at 90° C.: the loss in weight of the Liquid Glucose does not exceed 21 per cent.

Ash—Liquid glucose yields not more than 0.5 per cent of ash, page 556.

Acidity—A solution of 5 Gm. of Liquid Glucose in 15 cc. of distilled water, mixed with 5 drops of phenolphthalein T.S., requires not more than 0.6 cc. of tenth-normal sodium hydroxide to produce a pink color.

Sulfite—Dissolve 5 Gm. of Liquid Glucose in 50 cc. of distilled water, boil the solution for 1 minute, and cool, then add 0.2 cc. of tenth-normal iodine, followed by a few drops of starch T.S.: a blue color is produced.

Arsenic—Dissolve 1.5 Gm. of Liquid Glucose in 5 cc. of distilled water, add 5 cc. of sulfuric acid T.S. and 1 cc. of bromine T.S., and heat for 5 minutes on a water bath. Then add 0.5 Gm. of potassium iodide and 5 drops of stannous chloride T.S., cool, and test the solution for *arsenic*, page 554. The stain, if any, is not more intense than that produced in a test made with like quantities of the reagents and 2 cc. of the standard arsenic test solution, page 554.

Heavy metals—Mix thoroughly 2 Gm. of Liquid Glucose, 2 cc. of diluted acetic acid, and 15 cc. of distilled water. Dilute to 25 cc. with distilled water. The heavy metals limit, page 586, for Liquid Glucose is 10 parts per million.

Starch—Dissolve 5 Gm. of Liquid Glucose in 50 cc. of distilled water, boil the solution for 1 minute, and cool: the addition of 0.2 cc. of tenth-normal iodine produces no blue color.

Storage—Preserve Liquid Glucose in well-closed containers.

GLYCERINUM

Glycerin

Glycerin.—Glycerol



Mol. wt. 92.09

Glycerin is a polyhydric alcohol which contains not less than 95 per cent of $C_3H_5(OH)_3$.

Description—Glycerin is a clear, colorless, syrupy liquid, having a sweet taste. It has not more than a slight, characteristic odor, which is neither harsh nor disagreeable. When exposed to moist air, it absorbs water.

Solubility—Glycerin is miscible with water and with alcohol. It is insoluble in chloroform, ether, and in fixed and volatile oils.

Specific gravity—The specific gravity of Glycerin is not less than 1.249 at 25° C.

Identification—Heat in a test tube a few drops of Glycerin with about 0.5 Gm. of potassium bisulfate: pungent vapors of acrolein are evolved.

Non-volatile residue and ash—Heat 50 Gm. of Glycerin in an open, shallow, 100-cc. porcelain dish until it ignites, and allow it to burn without further application of heat in a place free from drafts: the weight of the carbonaceous and mineral residue does not exceed 0.015 per cent. Ignite this residue at a low red heat until combustion is complete: not more than 0.007 per cent of mineral residue remains.

Carbonizable substances—Shake 5 cc. of Glycerin vigorously with 5 cc. of sulfuric acid in a glass-stoppered, 25-cc. cylinder for 1 minute, and allow the liquid to stand for 1 hour: the mixture does not become darker than matching fluid H, page 563.

Reaction—An aqueous solution of Glycerin (1 in 20) is neutral to litmus paper.

Chloride—To 10 cc. of an aqueous solution of Glycerin (1 in 10) add 5 drops of diluted nitric acid and 0.5 cc. of silver nitrate T.S.: no turbidity is produced.

Sulfate—To 10 cc. of an aqueous solution of Glycerin (1 in 10) add 3 drops of diluted hydrochloric acid and 5 drops of barium chloride T.S.: no turbidity is produced.

Arsenic—A 10-cc. portion of an aqueous solution of Glycerin (1 in 10) meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Mix 4 cc. (5 Gm.) of Glycerin with 2 cc. of tenth-normal hydrochloric acid and dilute to 25 cc. with distilled water. The heavy metals limit, page 586, for Glycerin is 5 parts per million.

Acrolein, glucose, and ammonium compounds—A mixture of 5 cc. of Glycerin and 5 cc. of an aqueous solution of potassium hydroxide (1 in 10) does not become yellow when kept for 5 minutes at 60° C., nor does it emit an odor of ammonia.

Fatty acids and esters—Mix 40 cc. (50 Gm.) of Glycerin with 50 cc. of freshly boiled distilled water and 5 cc. of half-normal sodium hydroxide, boil the mixture for 5 minutes, then cool it, and titrate the excess of alkali with half-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Perform a blank determination with the same reagents and in the same manner, and make any necessary correction: it requires not less than 4 cc. of half-normal hydrochloric acid.

Color—The color of Glycerin, when viewed downward against a white surface in a 50-cc. Nessler tube, is not darker than the color of a standard made by diluting 0.40 cc. of ferric chloride C.S. with distilled water to 50 cc. in a Nessler tube of approximately the same diameter and color as that containing the Glycerin.

Storage—Preserve Glycerin in tight containers.

GLYCERITUM ACIDI TANNICI

Glycerite of Tannic Acid

Glycer. Acid. Tan.—Glycerite of Tannin

TANNIC ACID.....	20	Gm.
SODIUM CITRATE.....	1	Gm.
EXSICCATED SODIUM SULFITE.....	0.2	Gm.
GLYCERIN.....	78.8	Gm.
To make.....	100	Gm.

Rub the tannic acid, exsiccated sodium sulfite, and sodium citrate in a porcelain dish with about half of the glycerin until a smooth mixture is

produced, then add the remainder of the glycerin, and mix well. Heat the mixture on a sand bath to a temperature between 115° and 120° C., with occasional stirring, until solution is complete.

Storage—Preserve Glycerite of Tannic Acid in tight containers.

GLYCERITUM AMYLI

Glycerite of Starch

Glycer. Amyl.

STARCH.....	10	Gm.
BENZOIC ACID.....	0.2	Gm.
DISTILLED WATER.....	20	cc.
GLYCERIN.....	70	cc.

To make about..... 100 Gm.

Rub the starch and the benzoic acid with the distilled water in a porcelain dish until a smooth mixture is produced, then add the glycerin, and mix well. Heat the mixture on a sand bath to a temperature between 140° and 144° C., with constant but gentle stirring until a translucent, jelly-like mass results, and then strain through muslin.

Glycerite of Starch should be freshly prepared.

Storage—Preserve Glycerite of Starch in tight containers.

GLYCERITUM BOROGLYCERINI

Glycerite of Boroglycerin

Glycer. Boroglyc.

Glycerite of Boroglycerin contains not less than 47.5 per cent and not more than 52.5 per cent of boroglycerin ($C_3H_5BO_3$).

BORIC ACID, in fine powder.....	310	Gm.
GLYCERIN, a sufficient quantity,		
To make.....	1000	Gm.

Heat 460 Gm. of glycerin in a tared porcelain dish on a sand bath to a temperature between 140° and 150° C., and add the boric acid in portions, stirring constantly. When all of the boric acid is dissolved, maintain the liquid at the same temperature, frequently stirring it and

breaking up the film which forms on the surface, until the mixture has been reduced to a weight of 500 Gm.; then add 500 Gm. of glycerin, mix thoroughly, and immediately transfer the product to suitable containers.

Reaction—Glycerite of Boroglycerin turns moistened blue litmus paper red.

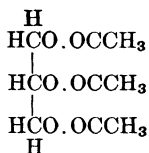
Assay—Weigh accurately into a flask of approximately 500-cc. capacity about 5 Gm. of Glycerite of Boroglycerin. Add 100 cc. of a mixture of equal volumes of distilled water and glycerin, previously neutralized to phenolphthalein T.S., and mix thoroughly. Titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Discharge the pink color by the addition of 50 cc. of the neutralized glycerin, and again titrate until the pink color reappears. Each cc. of normal sodium hydroxide is equivalent to 0.09989 Gm. of $C_3H_5BO_3$.

Storage—Preserve Glycerite of Boroglycerin in tight containers.

GLYCERYLIS TRIACETAS

Glyceryl Triacetate

Glyceryl. Triacet.—Triacetin



$C_9H_{14}O_6$

Mol. wt. 218.20

Description—Glyceryl Triacetate is a colorless, somewhat oily liquid with a slight, fatty odor, and a bitter taste.

Solubility—Glyceryl Triacetate is soluble in water. It is miscible with alcohol, with ether and with chloroform, and is insoluble in carbon disulfide.

Specific gravity—The specific gravity of Glyceryl Triacetate is not less than 1.154 and not more than 1.158 at 25° C.

Distillation range—Not less than 95 per cent of Glyceryl Triacetate distills between 257° and 260° C., page 559.

Refractive index—The refractive index of Glyceryl Triacetate is not less than 1.4288 and not more than 1.4296 at 25° C.

Identification—

A: Heat a few drops of Glyceryl Triacetate in a test tube with about 0.5 Gm. of potassium bisulfate: pungent vapors of acrolein are evolved.

B: The solution resulting from the determination of the saponification value of Glyceryl Triacetate responds to the test for acetate, page 587.

Moisture—Determine the moisture present in 150 cc. of Glyceryl Triacetate by the *Toluene Method*, page 629: not more than 0.3 cc. of water is present.

Free acid—Dilute 25 Gm. of Glyceryl Triacetate, accurately weighed, with 50 cc. of neutralized alcohol, add 5 drops of phenolphthalein T.S., and titrate with fiftieth-normal sodium hydroxide: not more than 1 cc. of fiftieth-normal sodium hydroxide is consumed.

Unsaturated compounds—To 10 cc. of Glyceryl Triacetate in a glass-stoppered tube add, dropwise, a solution of bromine in carbon tetrachloride (1 cc. in 100 cc.) until a permanent yellow color is produced, and allow to stand in a dark place for 18 hours: no turbidity or precipitate appears.

Saponification value—The saponification value of Glyceryl Triacetate is not less

than 765 and not more than 772, using from 0.5 Gm. to 0.6 Gm. of Triacetin, accurately weighed.

Storage—Preserve Glyceryl Triacetate in tight containers, and do not permit contact with metals.

GLYCYRRHIZA

Glycyrrhiza

Glycyrrh.—Licorice Root

Glycyrrhiza is the dried rhizome and roots of *Glycyrrhiza glabra* Linné var. *typica* Regel et Herder, known in commerce as Spanish Licorice, or of *Glycyrrhiza glabra* Linné var. *glandulifera* Waldstein et Kitaibel, known in commerce as Russian Licorice, or of other varieties of *Glycyrrhiza glabra* Linné, yielding a yellow and sweet wood (Fam. *Leguminosæ*).

Glycyrrhiza yields not more than 2.5 per cent of acid-insoluble ash, page 629.

Description—

Unground Spanish Licorice—Nearly cylindrical, the upper portion more or less knotty; usually in pieces from 14 to 20 cm. or more in length and from 5 to 20 mm. in thickness; externally yellowish brown or dark brown, longitudinally wrinkled, the thinner rhizomes often having prominent alternate buds, the thicker rhizomes having distinct corky patches; fracture coarsely fibrous; internally yellow, radiate; odor distinctive; taste sweetish and slightly acid.

Unground Russian Licorice—Nearly cylindrical, somewhat tapering, sometimes split longitudinally, from 15 to 30 cm. in length and from 1 to 5 cm. in diameter; when deprived of the outer corky layer, it is externally pale yellow; fracture coarsely fibrous; internally pale yellow; wood radially cleft; odor distinctive, taste sweetish.

Histology—Rhizome with numerous layers of yellowish brown cork cells, absent in the peeled drug; one or more rows of cells with a tendency of collenchymatous thickening; a middle bark of starch-bearing parenchyma and groups of fibers more or less surrounded with crystal-fibers; inner bark with radial arrangements of phloem and medullary rays, the phloem consisting of wedges of small groups of bast-fibers more or less surrounded with crystal-fibers and parenchyma separated tangentially by sieve tissue, the cells of the latter with thick, highly refracting walls; medullary rays from 1 to 8 cells wide; wood-wedges broad, consisting of large tracheæ with yellowish walls, small compact groups of wood-fibers more or less surrounded with crystal fibers, tracheids, and starch-bearing parenchyma; pith of large, more or less polygonal, starch-bearing parenchyma or occasionally containing prisms of calcium oxalate. In roots the pith is absent.

Powdered Glycyrrhiza—Brownish yellow (unpeeled Licorice) or pale yellow (peeled Licorice); starch grains numerous, mostly simple and elliptical, oval or spheroidal, from 2 to 20 microns in diameter; tracheæ mostly with bordered pores up to 200 microns in diameter; wood- and bast-fibers numerous, very long, much attenuated at the ends and about 10 microns in width; crystal-fibers with monoclinic prisms of calcium oxalate, the latter from 10 to 30 microns in length; fragments of reddish brown cork cells which are practically absent in the powder prepared from peeled Licorice.

U. S. P. Products of Glycyrrhiza—Extractum Glycyrrhizæ, Extractum Glycyrrhizæ Purum, Fluidextractum Glycyrrhizæ, Syrupus Glycyrrhizæ.

GOSSYPIUM PURIFICATUM

Purified Cotton

Gossyp. Purif.—Absorbent Cotton

The hairs of the seed of cultivated varieties of *Gossypium hirsutum* Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*), freed from adhering impurities, deprived of fatty matter, bleached, and sterilized.

Description—White, soft, fine filament-like hairs appearing under the microscope as hollow, flattened, and twisted bands, striate and slightly thickened at the edges. It is nearly odorless and almost tasteless.

Solubility—Purified cotton is insoluble in ordinary solvents, but is soluble in ammoniated cupric oxide T.S.

Ash—Place about 5 Gm. of Purified Cotton, accurately weighed, in a porcelain or platinum dish, and moisten with diluted sulfuric acid. Gently heat the cotton until it is charred, then ignite more strongly until the carbon is completely consumed: the ash weighs not more than 0.2 per cent of the weight of the Cotton.

Alkali or acid—Thoroughly saturate about 10 Gm. of Purified Cotton with 100 cc. of recently boiled and cooled distilled water, then with the aid of a glass rod press out two 25-cc. portions of the water into white porcelain dishes. Add to one portion 3 drops of phenolphthalein T.S. and to the other portion 1 drop of methyl orange T.S.: no pink color develops in either portion.

Dyes—Pack about 10 Gm. of Purified Cotton in a narrow percolator, and extract slowly with alcohol until the percolate measures 50 cc.: when observed downward through a column 20 cm. in depth, the percolate may show a yellowish color, but neither a blue nor a green tint.

Fatty matter—Pack 10 Gm., $\approx$ 10 mg., of Purified Cotton in a Soxhlet extractor, and extract with ether, adjusting the temperature so that the ether will siphon over not less than 4 times per hour into the tared flask of the extraction apparatus, and continue the extraction for 5 hours. The ether solution in the flask shows no trace of blue, green, or brownish color. Evaporate the extract to dryness, and dry for 1 hour at 105° C.: the weight of the residue does not exceed 0.07 Gm.

Water-soluble substances—Place 10 Gm. of Purified Cotton, accurately weighed, in a beaker containing 1000 cc. of distilled water, and boil gently for 30 minutes, adding distilled water as required to maintain the volume. Pour the water through a funnel into another vessel, and press out the excess water from the cotton with a glass rod about one-fourth inch in diameter. Wash the cotton in the funnel with two 250-cc. portions of boiling distilled water, pressing the cotton after each washing. Filter the combined extract and washings, washing the filter thoroughly with hot distilled water. Evaporate the combined extract and washings to a small volume, transfer to a tared porcelain or platinum dish, evaporate to dryness, and dry the residue to constant weight at 105° C.: the residue weighs not more than 25 mg.

Fiber length—Determine the fiber length of Purified Cotton, as directed under *Fiber Length of Cotton*, page 581: not less than 60 per cent, by weight, of the fibers shall be 12.70 mm. ($\frac{1}{2}$ inch) or greater in length, and not more than 10 per cent, by weight, of the fibers shall be 6.35 mm. ($\frac{1}{4}$ inch) or less in length.

Sterility—Purified Cotton meets the requirements of the *Sterility Tests for Solids*, page 610.

Absorbency—Place 5 Gm. of Purified Cotton in a wire basket weighing not more than 3 Gm. as directed under *Absorbency of Purified Cotton*, page 551: it is completely submerged in distilled water in 10 seconds at a temperature of 25° C., and upon removal from the water and draining for 10 seconds, retains not less than 24 times its weight of water.

Storage—Package Purified Cotton in rolls of not more than 454 Gm. (1 pound) of a continuous lap, with a light-weight paper running under the entire lap, the paper

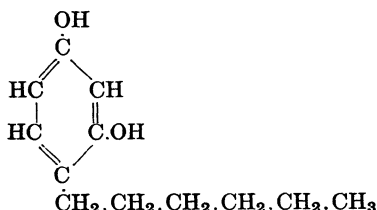
being of such width that it may be folded over the edges of the lap to a distance of at least one inch, the two together being tightly and evenly rolled, and enclosed and sealed in a second well-closed container. Purified Cotton may also be packaged in other types of containers if these are so constructed that the sterility of the product is maintained.

Purified Cotton shall be sterilized in the sealed container, and the container shall bear a statement to the effect that the sterility of the Cotton cannot be guaranteed if the package bears evidence of damage or if the package has been opened previously.

HEXYLRESORCINOL

Hexylresorcinol

Hexylresorcin.



$\text{C}_{12}\text{H}_{18}\text{O}_2$

Mol. wt. 194.26

Hexylresorcinol, when dried to constant weight over sulfuric acid, contains not less than 98 per cent of $\text{C}_{12}\text{H}_{18}\text{O}_2$.

Description—Hexylresorcinol occurs as white, needle-shaped crystals. It has a faint, fatty odor and a sharp, astringent taste, and produces a sensation of numbness when placed on the tongue. It acquires a brownish pink tint on exposure to light and air.

Solubility—One Gm. of Hexylresorcinol dissolves in about 2000 cc. of water at 25°C . It is freely soluble in alcohol, in glycerin, in ether, in chloroform, in benzene, and in vegetable oils.

Melting point—Hexylresorcinol melts at a temperature not below 62°C ., page 595.

Identification—

A: Add 1 cc. of nitric acid to 1 cc. of a saturated aqueous solution of Hexylresorcinol: a light red color appears.

B: Add 1 cc. of bromine T.S. to 1 cc. of a saturated aqueous solution of Hexylresorcinol: a yellow, flocculent precipitate forms. Upon the addition of 2 cc. of ammonia T.S., the precipitate dissolves, producing a solution with a yellow color.

Ash—Hexylresorcinol yields not more than 0.1 per cent of ash, page 556.

Acid—Dissolve 0.25 Gm. of Hexylresorcinol in 500 cc. of distilled water, and titrate the solution with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator: not more than 1 cc. of alkali is required.

Resorcinol and other phenols—Shake about 1 Gm. of Hexylresorcinol with 50 cc. of distilled water for a few minutes, filter, and add 3 drops of ferric chloride T.S. to the filtrate: no red or blue color is produced.

Assay—Dissolve from 70 to 100 mg. of Hexylresorcinol, previously dried to constant weight over sulfuric acid and accurately weighed, in 10 cc. of methanol in a 250-cc. iodine flask. Add exactly 30 cc. of tenth-normal bromine, add quickly 5 cc. of hydrochloric acid, and stopper the flask immediately. Cool the flask under run-

ning water to room temperature, and shake it vigorously for 5 minutes. Cautiously remove the stopper, add 6 cc. of potassium iodide T.S., and swirl gently. Add 1 cc. of chloroform, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal bromine is equivalent to 0.004857 Gm. of $C_{12}H_{18}O_2$.

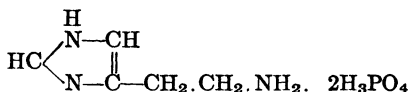
Storage—Preserve Hexylresorcinol in tight, light-resistant containers.

AVERAGE DOSE—Anthelmintic, Metric, 1 Gm.—Apothecaries, 15 grains.

HISTAMINÆ PHOSPHAS

Histamine Phosphate

Histamin. Phos.—Histamine Acid Phosphate



$C_5H_9N_3 \cdot 2H_3PO_4$

Mol. wt. 307.15

Description—Histamine Phosphate occurs as clear, colorless, odorless, long prismatic crystals. It is stable in air but is affected by light.

Solubility—One Gm. of Histamine Phosphate dissolves in about 4 cc. of water at 25° C.

Melting point—Histamine Phosphate melts at about 130° C., page 595.

Identification—

A: Dissolve 0.1 Gm. of Histamine Phosphate in 7 cc. of distilled water and 3 cc. of sodium hydroxide T.S., and add the solution to a mixture of 50 mg. of sulfanilic acid, 10 cc. of distilled water, 2 drops of hydrochloric acid, and 2 drops of an aqueous solution of sodium nitrite (1 in 10): a deep red color is produced.

B: An aqueous solution of Histamine Phosphate (1 in 50) is precipitated by phosphotungstic acid T.S.

C: Dissolve 50 mg. of Histamine Phosphate in 5 cc. of hot distilled water, add a hot solution of 50 mg. of picrolonic acid in 10 cc. of alcohol, and allow to crystallize. Filter the crystals with suction, wash with a small amount of ice-cold distilled water, and dry at 100° C.: the crystals melt between 265° and 268° C., page 595.

D: An aqueous solution of Histamine Phosphate (1 in 10) responds to the tests for phosphates, page 592.

Loss on drying—When dried at 100° C. for 1 hour, Histamine Phosphate loses not more than 1.5 per cent of its weight.

Reaction—An aqueous solution of Histamine Phosphate (1 in 50) is acid to litmus paper.

Storage—Preserve Histamine Phosphate in well-closed, light-resistant containers.

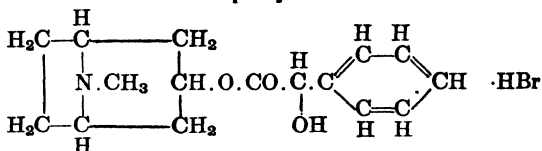
U. S. P. Product of Histamine Phosphate—Injectio Histaminæ Phosphatis.

AVERAGE DOSE—Subcutaneous, Metric, 0.3 mg.—Apothecaries, $\frac{1}{200}$ grain.

HOMATROPINÆ HYDROBROMIDUM

Homatropine Hydrobromide

Homatrop. Hydrobrom.



$C_{16}H_{21}O_3N \cdot HBr$

Mol. wt. 356.26

Description—Homatropine Hydrobromide occurs as white crystals, or as a white, crystalline powder. It is affected by light.

Caution—*Homatropine Hydrobromide is extremely poisonous.*

Solubility—One Gm. of Homatropine Hydrobromide dissolves in 6 cc. of water, in 40 cc. of alcohol, and in about 420 cc. of chloroform, at 25° C. It is insoluble in ether.

Melting point—Homatropine Hydrobromide melts at about 212° C. with partial decomposition, page 595.

Identification—

A: Iodine T.S. produces a brown precipitate in an aqueous solution of Homatropine Hydrobromide.

B: Add a slight excess of ammonia T.S. to 1 cc. of an aqueous solution of Homatropine Hydrobromide (1 in 100), shake the mixture with chloroform, and evaporate the chloroform solution to dryness on a water bath. Warm the residue so obtained with about 1.5 cc. of a solution made by dissolving 1 Gm. of mercuric chloride in 50 cc. of a mixture of 5 volumes of alcohol and 3 volumes of distilled water: the mixture is at first yellow and finally becomes brick-red (difference from *most other alkaloids except atropine and hyoscyamine*).

C: Homatropine Hydrobromide responds to the tests for bromide, page 588.

Loss on drying—When dried over sulfuric acid for 18 hours, Homatropine Hydrobromide loses not more than 1.5 per cent of its weight.

Ash—The ash from 0.2 Gm. of Homatropine Hydrobromide is negligible, page 556.

Reaction—An aqueous solution of Homatropine Hydrobromide (1 in 20) is neutral to litmus paper.

Atropine, hyoscyamine, or scopolamine—Add 5 drops of nitric acid to about 10 mg. of Homatropine Hydrobromide, and evaporate the mixture to dryness in a porcelain dish on a water bath: the residue does not become violet on the addition of a few drops of alcoholic potassium hydroxide T.S.

Most other alkaloids—One cc. of an aqueous solution of Homatropine Hydrobromide (1 in 20) yields no precipitate with tannic acid T.S. Another 1-cc. portion of the solution, acidulated with hydrochloric acid, yields no precipitate with platonic chloride T.S.

Storage—Preserve Homatropine Hydrobromide in well-closed, light-resistant containers.

HYDRARGYRI BICHLORIDUM

Mercury Bichloride

Hydrarg. Bichlorid.—Corrosive Mercuric Chloride,
Corrosive Sublimate, Mercuric Chloride

$HgCl_2$

Mol. wt. 271.52

Mercury Bichloride, when dried over sulfuric acid for 18 hours, contains not less than 99.5 per cent of $HgCl_2$.

Description—Mercury Bichloride occurs as heavy, colorless, odorless crystals, as crystalline masses, or as a white powder.

Caution—*Mercury Bichloride is extremely poisonous.*

Solubility—One Gm. of Mercury Bichloride dissolves in 13.5 cc. of water, in 3.8 cc. of alcohol, in about 12 cc. of glycerin, and in 25 cc. of ether, at 25° C. One Gm. dissolves in 2.1 cc. of boiling water and in 1.6 cc. of boiling alcohol.

Identification—An aqueous solution of Mercury Bichloride (1 in 20) responds to the tests for mercuric compounds, page 591, and for chloride, page 589.

Loss on drying—When dried over sulfuric acid for 18 hours, Mercury Bichloride loses not more than 1 per cent of its weight.

Residue on ignition—When Mercury Bichloride is strongly heated, it volatilizes, leaving not more than 0.1 per cent of residue.

Ether-insoluble residue—Add 1 Gm. of Mercury Bichloride to 50 cc. of ether contained in a flask. Shake until no more dissolves, and then filter through a sintered glass crucible, which has been previously washed with ether, heated for 30 minutes at 50° C., and weighed. Wash the crucible and contents with small portions of ether, using a total of 25 cc. Heat the crucible for 30 minutes at 50° C., and weigh: the weight of residue does not exceed 3 mg.

Reaction—An aqueous solution of Mercury Bichloride (1 in 20) is acid to litmus paper, but becomes neutral upon the addition of sodium chloride.

Assay—Dry about 0.5 Gm. of Mercury Bichloride for 18 hours over sulfuric acid, weigh accurately, and dissolve it in 300 cc. of warm distilled water, to which 1 cc. of hydrochloric acid has been added. Pass hydrogen sulfide through the solution until the precipitate of mercuric sulfide readily subsides, leaving a clear, supernatant liquid. Collect the precipitate on counterpoised filters or in a tared Gooch crucible, wash it well with cold distilled water, and finally with 3 portions of about 10 cc. each of alcohol. Then close the tip of the funnel or of the Gooch crucible holder, add sufficient carbon tetrachloride to cover the precipitate, cover the funnel or crucible with a watch glass, and allow it to stand for about 30 minutes. Drain off the solvent, and wash the precipitate with further portions of carbon tetrachloride until, after evaporating about 1 cc. of the last filtrate, no visible residue remains. Remove the adhering carbon tetrachloride by washing the precipitate with several portions of 10 cc. each of alcohol, and, after drying in the air, transfer to an oven, and dry to constant weight at about 110° C. The weight of mercuric sulfide, multiplied by 1.167, indicates its equivalent in HgCl₂.

Storage—Preserve Mercury Bichloride in well-closed containers.

U. S. P. Products of Mercury Bichloride—Toxitabellæ Hydrargyri Bichloridi Magnæ, Toxitabellæ Hydrargyri Bichloridi Parvæ.

HYDRARGYRI CHLORIDUM MITE

Mild Mercurous Chloride

Hydrarg. Chlorid. Mit.—Mercurous Chloride, Calomel, Subchloride of Mercury
HgCl Mol. wt. 236.07

¹ Mild Mercurous Chloride, when dried over sulfuric acid for 18 hours, contains not less than 99.6 per cent of HgCl.

Description—Mild Mercurous Chloride is a heavy, white, impalpable powder, becoming yellowish white when triturated with strong pressure. It is odorless and is stable in air, but gradually darkens when exposed to light.

Solubility—Mild Mercurous Chloride is insoluble in water, in alcohol, in ether, and in cold dilute acids.

Identification—

A: Mild Mercurous Chloride is blackened by contact with calcium hydroxide T.S., with solutions of alkali hydroxides, or with ammonia T.S.

B: When heated in a dry glass tube with an equal weight of reagent anhydrous sodium carbonate, Mild Mercurous Chloride yields metallic mercury which condenses on the wall of the tube. When the residue in the tube is dissolved in nitric acid, filtered, and silver nitrate T.S. added to the filtrate, a white, curdy precipitate is produced.

Loss on drying—When dried over sulfuric acid for 18 hours, Mild Mercurous Chloride loses not more than 0.5 per cent of its weight.

Residue on ignition—When Mild Mercurous Chloride is strongly heated, it volatilizes without fusion or the evolution of brown vapors, and leaves not more than 0.1 per cent of residue.

Ammonia—Heat 1 Gm. of Mild Mercurous Chloride with sodium hydroxide T.S.: no ammonia is evolved.

Mercury bichloride—Shake 2 Gm. of Mild Mercurous Chloride with 20 cc. of ether for 5 minutes, filter, and allow the filtrate to evaporate spontaneously: the residue, dissolved in 10 cc. of distilled water and 2 drops of diluted nitric acid, shows no more *chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Assay—Dry about 0.7 Gm. of Mild Mercurous Chloride for 18 hours over sulfuric acid, weigh accurately, mix well with 10 cc. of distilled water in a glass-stoppered flask, and add 50 cc. of tenth-normal iodine and 5 Gm. of potassium iodide, dissolved in 10 cc. of distilled water. Stopper the flask, allow the mixture to stand with occasional agitation until complete solution takes place, and then titrate the residual iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.02361 Gm. of HgCl.

Storage—Preserve Mild Mercurous Chloride in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 0.12 Gm.—Apothecaries, 2 grains.

HYDRARGYRI OXIDUM FLAVUM

Yellow Mercuric Oxide

Hydrarg. Oxid. Flav.—Yellow Precipitate

HgO

Mol. wt. 216.61

Yellow Mercuric Oxide, when dried to constant weight at 110° C., contains not less than 99.5 per cent of HgO.

Description—Yellow Mercuric Oxide is a yellow to orange yellow, heavy, impalpable powder. It is odorless and is stable in air, but becomes discolored on exposure to light.

Solubility—Yellow Mercuric Oxide is practically insoluble in water, and is insoluble in alcohol. It is readily dissolved by diluted hydrochloric and diluted nitric acids, forming colorless solutions.

Identification—Mix 1 Gm. of Yellow Mercuric Oxide with 20 cc. of distilled water, and add just enough hydrochloric acid, drop by drop, to effect solution: this solution responds to the tests for mercuric compounds, page 591.

Loss on drying—When dried to constant weight at 110° C., Yellow Mercuric Oxide loses not more than 2 per cent of its weight.

Residue on ignition—When Yellow Mercuric Oxide is strongly heated, it volatilizes, leaving not more than 0.2 per cent of residue.

Acid-insoluble substances—A solution of 0.5 Gm. of Yellow Mercuric Oxide in 25 cc. of either diluted hydrochloric or diluted nitric acid is not more than slightly turbid.

Alkali—When moistened with hot distilled water, Yellow Mercuric Oxide is not alkaline to litmus paper.

Distinction from red mercuric oxide—Dissolve 1 Gm. of oxalic acid in 1 cc. of ammonia T.S., diluted with 10 cc. of distilled water. To this solution add 0.5 Gm. of Yellow Mercuric Oxide, and heat the mixture in a test tube on a water bath for 2 hours, replacing from time to time the water lost by evaporation: the Oxide is converted into white or yellowish white mercuric oxalate.

Assay—Dry about 0.5 Gm. of Yellow Mercuric Oxide to constant weight at 110° C., weigh accurately, dissolve it in a mixture of 10 cc. of distilled water and 5 cc. of nitric acid, and dilute the solution with 150 cc. of cold distilled water. Then add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01083 Gm. of HgO.

Storage—Preserve Yellow Mercuric Oxide in well-closed, light-resistant containers.

U. S. P. Product of Yellow Mercuric Oxide—Unguentum Hydrargyri Oxidi Flavi.

HYDRARGYRI SALICYLAS

Mercuric Salicylate

Hydrarg. Salicyl.

$\text{HgC}_7\text{H}_4\text{O}_3$

Mol. wt. 336.71

Mercuric Salicylate contains the equivalent of not less than 54 per cent and not more than 59.5 per cent of Hg.

Description—Mercuric Salicylate occurs as a white, or slightly yellow or slightly pink, odorless powder. It is affected by light.

Solubility—Mercuric Salicylate is practically insoluble in water and in alcohol. It is dissolved by solutions of the fixed alkali hydroxides, by solutions of the alkali carbonates, and by solutions of alkali halides.

Identification—

A: Heat 1 Gm. of Mercuric Salicylate with 25 cc. of hydrochloric acid and cool the solution: salicylic acid separates. Filter the mixture, nearly neutralize the filtrate with ammonia T.S., and immerse copper foil in it: a coating of metallic mercury forms on the foil.

B: Mix 0.5 Gm. of Mercuric Salicylate with 10 cc. of distilled water, and add a few drops of ferric chloride T.S.: the mixture acquires a violet color.

Residue on ignition—When ignited, Mercuric Salicylate leaves not more than 0.1 per cent of residue.

Alkali-insoluble substances—Add 4 cc. of normal sodium hydroxide to 0.2 Gm. of Mercuric Salicylate, and shake the mixture gently: the Mercuric Salicylate dissolves completely.

Foreign mercury compounds—No dark color results at once on shaking about 0.1 Gm. of Mercuric Salicylate with 5 cc. of hydrogen sulfide T.S.

Assay—Digest about 0.5 Gm. of Mercuric Salicylate, accurately weighed, with a mixture of 15 cc. of sulfuric acid and 15 cc. of nitric acid, contained in a Kjeldahl flask in the mouth of which a small funnel is inserted, then heat upon a sand bath until colorless. Cool the solution, cautiously dilute with 150 cc. of distilled water, cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

Storage—Preserve Mercuric Salicylate in well-closed, light-resistant containers.

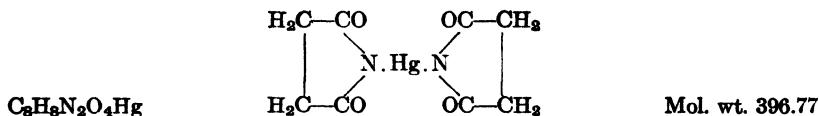
U. S. P. Product of Mercuric Salicylate—Injectio Hydrargyri Salicylatis.

AVERAGE DOSE—Intramuscular, in oil—Metric, 60 mg.—
Apothecaries, 1 grain.

HYDRARGYRI SUCCINIMIDUM

Mercuric Succinimide

Pydrarg. Succinim.



Mercuric Succinimide, when dried over sulfuric acid for 18 hours, contains not less than 49.5 per cent and not more than 51 per cent of Hg, corresponding to not less than 98 per cent of $\text{C}_8\text{H}_8\text{N}_2\text{O}_4\text{Hg}$.

Description—Mercuric Succinimide occurs as small, white crystals, or as a white powder. It is odorless and is stable in air, but darkens on exposure to light.

Solubility—One Gm. of Mercuric Succinimide dissolves in 20 cc. of water at 25°C ., and in about 5 cc. of boiling water. It is slightly soluble in alcohol and is insoluble in ether.

Identification—

- A: The addition of sodium hydroxide T.S. to an aqueous solution of Mercuric Succinimide (1 in 25) produces a yellowish white precipitate which is reduced to metallic mercury when the mixture is heated.
- B: Add potassium iodide T.S., drop by drop, to a solution of Mercuric Succinimide (1 in 25): a yellow precipitate is produced which dissolves on the addition of an excess of the reagent.
- C: Heated with about five times its weight of zinc dust, Mercuric Succinimide evolves pyrrol, which imparts a red color to a pine shaving moistened with hydrochloric acid and held in the vapor.
- D: Disperse about 0.5 Gm. of finely powdered Mercuric Succinimide in 50 cc. of cold ether in a flask, and pass hydrogen sulfide through the mixture until it has a distinct odor of hydrogen sulfide: a black precipitate of mercuric sulfide is produced. Filter the mixture, evaporate the clear filtrate to dryness, and dry for 1 hour at 100°C .: the residue of succinimide melts between 123° and 125°C ., page 595.

Loss on drying—Mercuric Succinimide, when dried over sulfuric acid for 18 hours, loses not more than 2 per cent of its weight.

Residue on ignition—When ignited, Mercuric Succinimide leaves not more than 0.1 per cent of residue, page 556.

Reaction—An aqueous solution of Mercuric Succinimide (1 in 25) is neutral to litmus paper.

Chloride—Add 5 drops of silver nitrate T.S. to 5 cc. of an aqueous solution of Mercuric Succinimide (1 in 25) previously mixed with 2 drops of diluted nitric acid: no opalescence is produced.

Mercury—Add 5 drops of clear albumen T.S. to 5 cc. of an aqueous solution of Mercuric Succinimide (1 in 25): no turbidity is produced.

Assay—Dry about 0.5 Gm. of Mercuric Succinimide over sulfuric acid for 18 hours, and weigh accurately. Dissolve it in 10 cc. of nitric acid, and dilute with 150 cc. of cold distilled water. Add 3 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

Storage—Preserve Mercuric Succinimide in well-closed, light-resistant containers.

AVERAGE DOSE—Intramuscular, Metric, 15 mg.—Apothecaries,
 $\frac{1}{4}$ grain.

HYDRARGYRUM

Mercury

Hydrarg.—Quicksilver

Hg

At. wt. 200.61

Description—Mercury is a bright, shining, silver white metal, liquid at ordinary temperatures, and easily divisible into spherical globules. Mercury has a specific gravity of about 13.5 at 25° C.

Solubility—Mercury is insoluble in the ordinary solvents, in hydrochloric acid, and at ordinary temperatures in sulfuric acid, but it dissolves in the latter upon boiling. It is readily and completely dissolved by nitric acid.

Residue on ignition—Place about 5 Gm. of Mercury, accurately weighed, in a porcelain crucible. Add a mixture of 5 cc. of nitric acid and 3 cc. of distilled water, and cover loosely with a watch glass. When the reaction has subsided, evaporate on a water bath, and carefully ignite to constant weight: not more than 0.01 per cent of residue remains.

Foreign substances—Drop a few globules of Mercury on white paper: they retain their globular form, roll about freely, and leave no streaks on the paper.

Storage—Preserve Mercury in strong, well-closed containers.

U. S. P. Products of Mercury—Hydrargyrum cum Creta, Unguentum Hydrargyri Forte, Unguentum Hydrargyri Mite.

HYDRARGYRUM AMMONIATUM

Ammoniated Mercury

Hydrarg. Ammon.—White Precipitate

 HgNH_2Cl

Mol. wt. 252.09

Ammoniated Mercury contains HgNH_2Cl , corresponding to not less than 78 per cent and not more than 80 per cent of Hg.

Description—Ammoniated Mercury occurs in white, pulverulent pieces or as a white, amorphous powder. It is odorless, and is stable in air, but is affected by light.

Solubility—Ammoniated Mercury is insoluble in water and in alcohol. It is readily soluble in warm hydrochloric, nitric, and acetic acids.

Identification—

A: One Gm. of Ammoniated Mercury is soluble in a cold solution of 5 Gm. of sodium thiosulfate in 5 cc. of distilled water, with the evolution of ammonia. When this solution is heated for a short time, red mercuric sulfide is precipitated which, upon protracted boiling, turns black.

B: When heated with sodium hydroxide T.S., Ammoniated Mercury becomes yellow and ammonia is evolved.

C: A solution of Ammoniated Mercury in diluted nitric acid yields with potassium iodide T.S. a red precipitate, which is soluble in an excess of the reagent. The nitric acid solution yields a white precipitate with silver nitrate T.S.

Residue on ignition—When Ammoniated Mercury is strongly heated, it volatilizes, leaving not more than 0.2 per cent of residue.

Mercurous compounds—Ammoniated Mercury is completely soluble in warm hydrochloric acid.

Assay—Dissolve about 0.5 Gm. of Ammoniated Mercury, accurately weighed, in 2 cc. of hydrochloric acid and 10 cc. of distilled water, warming gently until solution is effected, then dilute with 300 cc. of distilled water, and proceed as directed under *Hydrargyri Bichloridum*, page 211, beginning with the words "Pass hydrogen sulfide." The weight of mercuric sulfide, multiplied by 0.8622, indicates its equivalent in Hg.

Storage—Preserve Ammoniated Mercury in well-closed, light-resistant containers.

U. S. P. Product of Ammoniated Mercury—Unguentum Hydrargyri Ammoniatum.

HYDRARGYRUM CUM CRETA

Mercury with Chalk

Hydrarg. c. Cret.—Gray Powder

Mercury with Chalk contains not less than 36 per cent and not more than 40 per cent of Hg.

MERCURY.....	38 Gm.
HONEY.....	10 Gm.
PREPARED CHALK.....	57 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	100 Gm.

Weigh the mercury and honey successively into a strong bottle of 100-cc. capacity, and add 2 cc. of distilled water. Stopper the bottle, and shake it for about 30 minutes at a time until the aggregate time of shaking reaches 10 hours, or until the globules of mercury are no longer visible under a lens magnifying four diameters. The shaking may be more conveniently performed by mechanical means. Rub the prepared chalk with distilled water in a mortar to a thick, creamy paste, add the contents of the bottle, washing out the last portions with a little distilled water, and triturate the mixture until uniform. Finally dry the mixture, first between ample layers of bibulous paper, and afterwards in a dish at ordinary temperature until it weighs 100 Gm. Then reduce it to a uniform powder without trituration.

Description—Mercury with Chalk is a light gray, rather damp powder, free from grittiness. It is odorless, has a slightly sweet taste, and is affected by light.

Identification—Digest 0.1 Gm. of Mercury with Chalk with 20 cc. of warm acetic acid: the chalk dissolves with effervescence, and a residue of finely divided mercury remains.

Mercurous oxide—Filter the mixture obtained in the *identification* test: the filtrate becomes not more than slightly opalescent on the addition of a few drops of hydrochloric acid.

Mercuric oxide—Digest 0.1 Gm. of Mercury with Chalk with 20 cc. of diluted hydrochloric acid at 40° C. for 15 minutes, and filter: the filtrate is not rendered more than slightly brown by hydrogen sulfide T.S.

Assay—Dissolve about 1 Gm. of Mercury with Chalk, accurately weighed, in a mixture of 10 cc. of distilled water and 10 cc. of nitric acid, and heat on a water bath until red fumes cease to be evolved and the liquid becomes colorless. Then add 150 cc. of cold distilled water and 2 cc. of ferric ammonium sulfate T.S., and titrate the solution with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

Storage—Preserve Mercury with Chalk in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 0.25 Gm.—Apothecaries, 4 grains.

HYOSCYAMUS

Hyoscyamus

Hyosc.—Henbane, *Hyoscyami folium* P.I.

Hyoscyamus is the dried leaf, with or without the tops, of *Hyoscyamus niger* Linné (Fam. *Solanaceæ*).

Hyoscyamus yields not less than 0.040 per cent of the alkaloids of *Hyoscyamus* and contains not more than 25 per cent of its stems, none of which is more than 7 mm. in thickness. It yields not more than 12 per cent of acid-insoluble ash, page 629.

Description—

Unground Hyoscyamus—Usually much wrinkled, matted and broken, frequently consisting of leaves, stems, and flowering and fruiting tops. Leaves ovate or ovate-lanceolate, inequilateral, with petioles up to one-third the length of the blade, or sessile; apex acute, margin irregularly dentate or pinnatifid with acute triangular lobes; hairy, densely so on the lower surface; upper surface dark green, lower surface light gray green; stems from 2 to 7 mm. in thickness, cylindrical or somewhat compressed, longitudinally wrinkled, hairy, gray green; flowers nearly sessile, with an urn-shaped, hairy, unequally 5-toothed calyx and a campanulate, slightly zygomorphic corolla, yellowish with purplish veins; fruit, a 2-locular pyxis enclosed in the calyx; odor distinctive; taste bitter and acrid.

Histology—Leaves: Upper and lower epidermis, in surface view, showing epidermal cells with smooth cuticle, slightly wavy, vertical walls and stomata of solanaceous type and uniseriate non-glandular and glandular hairs. Mesophyll of a layer of palisade parenchyma and a broader zone of spongy parenchyma with large intercellular air spaces, some of the parenchyma cells containing single prisms, twin crystals or rosette aggregates of calcium oxalate; in the midrib a crescent-shaped meristeles surrounded by the parenchyma with sphenoidal microcrystals and prisms.

Stems: Cortex and pith of parenchyma containing microcrystals; bundles bicollateral, the xylem with radially arranged groups of pitted, reticulate, spiral and bordered pore tracheae.

Seed: Campylotropous, subreniform, the coat closely verrucose, the kernel with curved embryo embedded in the endosperm.

Powdered Hyoscyamus—Grayish green to dark green. Hairs, uniseriate; non-glandular hairs unicellular to 10-celled; glandular hairs with 1- to 4-celled stalk and a multicellular head; calcium oxalate crystals in single or twin monoclinic prisms or in rosette aggregates from 10 to 25 microns in diameter; few sphenoidal microcrystals from 6 to 12 microns in length; sclerenchyma fibers attaining a length of 1 mm. and a width of 30 microns, some with wavy walls and end variously forked; pollen grains nearly smooth with 3 radiating furrows having a pore in the median part of each furrow, when dry or in alcohol distinctly elliptical and approximately 35 by 50 microns, but in water spherical and about

40 microns in diameter; epidermal cells of the seed coat with radial and inner walls greatly thickened and incrustated with granular crystals of silicic acid.

Assay—Place 25 Gm. of Hyoscyamus, in moderately coarse powder, in an extraction thimble, and insert the thimble in a Soxhlet, or similar extractor. Moisten the drug with a mixture of 8 cc. of stronger ammonia T.S., 10 cc. of alcohol, and 20 cc. of ether, and mix thoroughly. Macerate the mixture over night, then extract it for not less than 3 hours or until the alkaloids are completely extracted (see *Extraction of Drugs*, page 603), using ether as the solvent. The following alternative process may be used: Moisten 25 Gm. of Hyoscyamus, in moderately coarse powder (if a powder finer than “moderately coarse” is used for the assay, washed sand or asbestos fibers may be used to facilitate extraction) with a mixture of 8 cc. of stronger ammonia T.S., 20 cc. of ether, and 10 cc. of chloroform, in a small percolator, the outlet of which has been packed with a pledget of purified cotton. Macerate the mixture over night, pack it in the percolator, and extract by percolating slowly with a mixture of 3 volumes of ether and 1 volume of chloroform. Continue the percolation until the 3 or 4 cc. of percolate last passed, when evaporated to dryness and the residue dissolved in approximately half-normal sulfuric acid and treated with mercuric potassium iodide T.S., shows only a faint turbidity.

If the volume of liquid obtained by either the Soxhlet or percolation method of extraction is large, reduce it to a convenient volume by evaporating on a water bath.

Transfer the liquid to a separator, rinse the container with one or more small volumes of the solvent, and add the rinsings to the separator. Completely remove the alkaloids from the immiscible solvents by extracting with successive portions of approximately half-normal sulfuric acid (see *Purification of the Alkaloids*, page 604), filtering each portion drawn off. Render the combined acid solutions distinctly alkaline with ammonia T.S., and completely remove the alkaloids at once by extracting with successive portions of chloroform. Evaporate the combined chloroform extractions to dryness on a water bath, and continue the heating for 15 minutes. Re-dissolve the residue in a small volume of chloroform, evaporate to dryness on a water bath, and continue the heating for 15 minutes. Repeat this treatment for the third time. Dissolve the resulting residue in a few cc. of chloroform, add 15 cc. of fiftieth-normal sulfuric acid, remove the chloroform by evaporation, cool, and titrate the excess acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of hyoscyamus.

U. S. P. Products of Hyoscyamus—Extractum Hyoscyami (pilular and powdered), Tinctura Hyoscyami.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains

INFUSA

Infusions

Caution—The drug concentration of an infusion representing a potent drug should be specified by the physician.

An infusion may be dispensed only if it has been recently prepared.

If the drug concentration of an infusion is not otherwise specified, it is to be prepared according to the following general formula:

THE DRUG, coarsely comminuted.....	50 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Moisten the drug in a suitable vessel, preferably of earthenware and provided with a cover, with 50 cc. of cold distilled water, and allow it to stand for 15 minutes. Then add 900 cc. of boiling distilled water, cover the vessel tightly, and allow it to stand for 30 minutes. Then strain the mixture, and pass enough distilled water through the strainer to make the Infusion measure 1000 cc. If the activity of the Infusion is affected by the temperature of boiling water, cold distilled water should be used.

INJECTIONES

Injections

Solutions and suspensions of drugs indicated for parenteral administration are designated as "Injections." They must meet the requirements of the *Sterility Test for Liquids*, page 609. The terms "parenteral" and "for injection" as used here refer to the administration of a drug under one or more layers of the skin or mucous membranes.

The provisions which follow on pages 219 to 222 apply to all Pharmacopœial injections, pages 222 to 249, and to the other Pharmacopœial preparations for which compliance with these provisions is indicated.

Vehicles for Injections—All aqueous vehicles, diluents, and solvents used in preparing Injections must be pyrogen-free, as determined by the *Pyrogen Test*, page 606. Sterile isotonic solution of sodium chloride, page 274, or sterile isotonic solution of three chlorides, page 261, or another suitable aqueous solvent or vehicle may be used instead of Water for Injection, page 66, when the latter is designated in the individual monograph.

Oils used in preparing Injections are understood to include glycerides, other esters of fatty acids, and oleic acid. A 10-Gm. portion of the oil, glyceride, or other ester, or a mixture thereof, requires for neutralization not more than 2 cc. of tenth-normal sodium hydroxide. Oleic acid must meet all of the requirements under *Acidum Oleicum*, page 26.

Preparation of Injections—Injections are preferably prepared, filled into suitable containers, the containers sealed and the completed unit sterilized within one working day. If this is not practicable, and unless the bulk injection is bacteriostatic or is sterilized by one of the processes given on pages 614 to 620, the injection must be stored in containers holding not more than the amount required for a working day and stored under refrigeration at a temperature below that at which deterioration or bacterial growth will occur.

Preservatives and Other Added Substances—Preservatives and other substances may be added to injections to assure the permanency or usefulness of the products, but these substances must be non-toxic and harmless in the concentrations employed, and must not interfere with the therapeutic efficacy of the preparations, the assays, and the response to other tests given in the monographs of the respective injections, unless otherwise provided in the individual monograph.

Caution—Special care must be observed in the use of preservatives and other added substances in injections which are administered in volumes exceeding 5 cc.

Preservatives and other permissible added substances in Injections to be administered by routes other than intramuscular, subcutaneous, and intracutaneous must receive special attention as to the harmlessness of such substances in the concentrations employed.

Bacteriostatic Agents—If bacteriostatic agents are added, they should be used in such concentrations as to prevent the growth of all micro-organisms in the Injections. Sterilization processes must be employed in preparing Injections even though bacteriostatic agents are added.

A bacteriostatic agent may be employed in an injection which is packaged in single-dose containers and is prepared by aseptic manipulation (Process H), or by bacteriological filtration (Process F), or, in emergencies, by a procedure in which only one exposure at 100° C. is used in fractional moist-heat sterilization (Process E). In Injections packaged in multiple-dose containers, a bacteriostatic agent must be used, regardless of the method of sterilization employed, unless otherwise directed in a Pharmacopœial monograph.

Sterilization Methods—Safe processes of sterilization are designated in the individual monographs. Other processes of sterilization equally effective may be used instead of the indicated processes, provided the injection is not altered thereby and conforms to all official requirements.

Containers—For container specifications see *General Notices*, page 6, *Containers for Injections*, page 567, and the additional references in this chapter.

Single and Multiple Doses—Injections intended for intrathecal (intraspinal), intracisternal, intracardial and for intravenous administration are to be dispensed only in single-dose containers, unless otherwise specified in the individual monograph. Injections administered in volumes of 10 cc. or more at one time are to be dispensed as single doses. Each multiple-dose package of an intramuscular, subcutaneous, or intracutaneous injection is to contain a total volume of the Injection equiva-

lent to not more than the volume required for 10 *U. S. P. average doses* unless otherwise stated in the individual monograph. These provisions concerning single- and multiple-dose containers do not apply to injections for veterinary use. Injections packaged for veterinary use must be so labeled.

Determination of the Volume of Injection in Containers—To determine the volume of an injection in the containers, drain thoroughly into a dry, graduated cylinder, a counted number of not less than 5 of the containers if the size is 3 cc. or less, or not less than 3 of the containers if the size is more than 3 cc. and less than 10 cc., or at least 1 container if the size is more than 10 cc., and note the volume at 25° C. The size of the graduated cylinder should be such that the volume of the Injection from the number of containers used will occupy at least 40 per cent of the graduated capacity of the cylinder.

In measuring the volume of Injections containing oil or suspended substances, the containers are, if necessary, warmed to facilitate mixing and draining, then thoroughly shaken immediately before draining into the graduated cylinder, and after allowing to cool to 25° C. the volume noted.

Appearance of Solutions or Suspensions—Injections which are solutions of soluble medicaments must be clear, and free of any turbidity or undissolved material which can be detected readily without magnification when the solution is examined against black and white backgrounds with a bright light reflected from a 100-watt Mazda lamp or its equivalent.

When preparing an injection containing suspended medicaments, pass the product through a standard sieve of at least 200-mesh or employ equivalent treatment in a colloid mill.

Labeling—If the concentration of a drug in an Injection is not specified in the Pharmacopœia, the label on each container of such preparation is to indicate the percentage content of drug or the amount of such drug or drugs in a definite volume or weight of the preparation. If the Injection is an aqueous solution, water for injection, page 66, is designated as the vehicle. A vehicle other than water for injection may be employed, but the name of the vehicle used, if a Pharmacopœial preparation, or its composition if not a Pharmacopœial preparation, must be indicated on the labeling of *each package*. If an oil or a mixture of oils is used as the vehicle, the name of the oil used or if a mixture, the composition of the latter, giving the name and percentage of each oil present or the amount present in a definite volume, must be indicated

on the labeling of *each package*. A manufacturing lot number must appear on each container to identify the method and date of sterilization.

If one or more substances not specified in an injection monograph are added for stabilizing, or for anesthetic properties, or as preservatives, the name and quantity or proportion of each substance so used must be indicated on the labeling.

Quantities in Ampuls and Other Containers—The labeling on each single-dose container shall note the fact that the container holds a volume in excess of that designated, which excess is only sufficient to permit the withdrawal and administration of the exact volume indicated.

The labeling on packages holding individual containers, in each of which the volume is 20 cc. or less, is to bear all notations indicated above.

INJECTIO BISMUTHI ET POTASSII TARTRATIS

Bismuth and Potassium Tartrate Injection

Inj. Bism. et Pot. Tart.—Bismuth and Potassium Tartrate Ampuls

Bismuth and Potassium Tartrate Injection is a sterile solution of bismuth and potassium tartrate in water for injection or a sterile suspension of bismuth and potassium tartrate in a suitable fixed oil. It contains an amount of bismuth (Bi) equivalent to not less than 57 per cent and not more than 66 per cent of the labeled amount of bismuth and potassium tartrate, including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Bismuth and Potassium Tartrate Injection, when an oil suspension, preferably by Process C. Sterilize Bismuth and Potassium Tartrate Injection, when an aqueous solution, preferably by Process C, or by Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

BISMUTH AND POTASSIUM TARTRATE INJECTION—AQUEOUS SOLUTION

Identification—The aqueous Injection responds to *identification tests A, B, and C* under *Bismuthi et Potassii Tartras*, page 86.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, with distilled water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 0.4 Gm. of bismuth and potassium tartrate, into a beaker, and if necessary, dilute with distilled water to about 25 cc. Then proceed as directed in the *assay of Bismuthi et Potassii Tartras*, page 86, beginning with "Add 25 cc. of diluted nitric acid and stir . . ." The weight of the bismuth phosphate obtained, multiplied by 0.6876, represents the weight of bismuth in the volume of the Injection taken for the assay.

BISMUTH AND POTASSIUM TARTRATE INJECTION—OIL SUSPENSION

Identification—Transfer to a dry filter a sufficient volume of the suspension in oil to yield about 1 Gm. of bismuth and potassium tartrate, and wash it with purified benzoin until the oil is removed. Allow the benzoin to evaporate from the filter, then dissolve the residue on the filter by adding, in small portions, hot distilled water sufficient to make a 1 in 20 solution. This solution responds to *identification tests A, B, and C* under *Bismuthi et Potassii Tartras*, page 86.

Assay—Shake thoroughly the contents of the cylinder obtained in the *Determination of the Volume of Injection in Containers*, and at once transfer with a pipette, calibrated to contain an accurately measured volume of the suspension, equivalent to about 0.4 Gm. of bismuth and potassium tartrate, to a separator. Wash out the pipette with about 25 cc. of ether into the separator. Shake the suspension in the separator first with 20 cc. of diluted nitric acid, then with three successive portions of 15 cc. each of the acid, filtering the extracts through a small filter paper moistened with water, then wash the filter with 10 cc. of a mixture of equal volumes of diluted nitric acid and distilled water. To the combined acid extracts contained in a beaker add ammonia T.S. until a slight but permanent precipitate is produced, then add 1 cc. of nitric acid, or more if necessary, until the solution is clear. Dilute with distilled water to about 100 cc., then proceed as directed in the *assay of Bismuthi et Potassii Tartras*, page 86, beginning with "heat the solution to boiling." The weight of the bismuth phosphate so obtained, multiplied by 0.6876, represents the weight of bismuth in the volume of the Injection taken for the assay.

Storage—Preserve Bismuth and Potassium Tartrate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Bismuth and Potassium Tartrate Injection usually available contains the following amounts of bismuth and potassium tartrate: In water—30 mg. ($\frac{1}{2}$ grain) in 2 cc. In water—50 mg. ($\frac{3}{4}$ grain) in 2 cc. In oil—0.1 Gm. ($1\frac{1}{2}$ grains) in 2 cc. In oil—0.2 Gm. (3 grains) in 2 cc.

AVERAGE DOSE OF BISMUTH AND POTASSIUM TARTRATE—Intra-muscular, Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

INJECTIO BISMUTHI SUBSALICYLATIS**Bismuth Subsalsicylate Injection**

Inj. Bism. Subsalsicyl.—Bismuth Subsalsicylate Ampuls

Bismuth Subsalsicylate Injection is a sterile suspension of bismuth subsalsicylate in a suitable fixed oil. It contains an amount of bismuth (Bi) equivalent to not less than 53 per cent and not more than 62 per cent of the labeled amount of bismuth subsalsicylate, including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Bismuth Subsalsicylate Injection preferably by Process C. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—Transfer to a dry filter a sufficient volume of the Injection to yield about 1 Gm. of bismuth subsalicylate, wash it with purified benzin until the oil is removed, and allow the benzin to evaporate from the filter. The residue responds to *identification tests A and B* under *Bismuthi Subsalicylas*, page 88.

Assay—Shake thoroughly the contents of the cylinder obtained in the *Determination of the Volume of Injection in Containers*, and at once transfer with a pipette, calibrated to contain an accurately measured volume of the suspension, equivalent to about 0.4 Gm. of bismuth subsalicylate, to a separator. Wash out the pipette with about 25 cc. of ether into the separator. Shake the suspension in the separator first with 20 cc. of diluted nitric acid, then with three successive portions of 15 cc. each of the acid, filtering the extracts through a small filter paper, moistened with water, then wash the filter with 10 cc. of a mixture of equal volumes of diluted nitric acid and distilled water. To the combined acid extracts contained in a beaker add ammonia T.S. until a slight but permanent precipitate is produced, then add 1 cc. of nitric acid, or more if necessary, until the solution is clear. Dilute with distilled water to about 100 cc., then proceed as directed in the *assay of Bismuthi et Potassii Tartras*, page 86, beginning with "heat the solution to boiling." The weight of the bismuth phosphate so obtained, multiplied by 0.6876, represents the weight of bismuth in the volume of the suspension taken for the assay.

Storage—Preserve Bismuth Subsalicylate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Bismuth Subsalicylate Injection usually available contains the following amounts of bismuth subsalicylate: 0.1 Gm. ($1\frac{1}{2}$ grains) in 1 cc.; 0.12 Gm. (2 grains) in 1 cc.

AVERAGE DOSE OF BISMUTH SUBSALICYLATE—Intramuscular,
Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

INJECTIO CAFFEINÆ ET SODII BENZOATIS

Caffeine and Sodium Benzoate Injection

Inj. Caff. et Sod. Benz.—Caffeine and Sodium Benzoate Ampuls

Caffeine and Sodium Benzoate Injection is a sterile solution of caffeine and sodium benzoate in water for injection. It contains an amount of anhydrous caffeine equivalent to not less than 45 per cent and not more than 52 per cent, and an amount of sodium benzoate equivalent to not less than 47.5 per cent and not more than 55.5 per cent of the labeled amount of caffeine and sodium benzoate, including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Caffeine and Sodium Benzoate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—The Injection responds to *identification tests A and C* under *Caffeina et Sodii Benzoas*, page 93. When the end of a platinum wire is dipped in the Injection and introduced into a non-luminous flame, the flame is colored intensely yellow.

Assay for caffeine—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, with distilled water to an

exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 0.4 Gm. of caffeine and sodium benzoate, to a small separator, add about 5 cc. of distilled water and 1 drop of phenolphthalein T.S., then add tenth-normal sodium hydroxide, drop by drop, until a slight, permanent pink color is produced. Shake the solution with three or more successive portions of chloroform until the caffeine is completely extracted, passing each chloroform extract through a filter previously moistened with chloroform. (Retain the aqueous portion for the *assay for sodium benzoate*.) Wash the stem of the separator and the filter with a few cc. of warm chloroform to remove any adhering caffeine, and add these washings to the chloroform extracts. Evaporate the combined chloroform solution in a tared beaker or flask nearly to dryness on a water bath, then add 2 cc. of alcohol, evaporate to dryness, and dry to constant weight at 80° C.

Assay for sodium benzoate—To the aqueous liquid in the separator, obtained in the *assay for caffeine*, above, add 50 cc. of ether and a few drops of methyl orange T.S., and titrate with tenth-normal hydrochloric acid while intimately mixing the aqueous and ether layers by vigorous stirring, until a permanent orange color is produced in the aqueous layer. Each cc. of tenth-normal hydrochloric acid is equivalent to 0.01441 Gm. of sodium benzoate ($\text{NaC}_7\text{H}_5\text{O}_2$).

Storage—Preserve Caffeine and Sodium Benzoate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Caffeine and Sodium Benzoate Injection usually available contains the following amounts of caffeine and sodium benzoate: 0.25 Gm. (4 grains) in 2 cc.; 0.5 Gm. (7½ grains) in 2 cc.

AVERAGE DOSE OF CAFFEINE AND SODIUM BENZOATE—Intra-muscular, Metric, 0.5 Gm.—Apothecaries, 7½ grains.

INJECTIO CALCII GLUCONATIS

Calcium Gluconate Injection

Inj. Calc. Glucon.—Calcium Gluconate Ampuls

Calcium Gluconate Injection is a sterile solution of calcium gluconate in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of calcium gluconate ($\text{C}_{12}\text{H}_{22}\text{O}_{14}\text{Ca} \cdot \text{H}_2\text{O}$), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Calcium Gluconate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Calcium glycerosaccharate, calcium *d*-saccharate, or other calcium salts, may be added as stabilizers. The amount of such added calcium salts, calculated as calcium (Ca), does not exceed 5 per cent of the calcium (Ca) present as calcium gluconate.

Identification—The Injection responds to *identification tests A and B* under *Calcii Gluconas*, page 97.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, with distilled water to an exact volume,

and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 0.5 Gm. of calcium gluconate, to a beaker, add 2 cc. of hydrochloric acid and 100 cc. of distilled water, and heat to boiling. Make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat the mixture on a water bath for 1 hour, then filter through a hardened filter paper, and wash the precipitate thoroughly with warm distilled water until the last washing gives no reaction for oxalate. Puncture the filter paper, and wash the precipitate into a beaker with a stream of hot water, then follow with 30 cc. of dilute (1 in 3) sulfuric acid. Heat the solution to 80° C., and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.02242 Gm. of calcium gluconate ($C_{12}H_{22}O_{14}Ca.H_2O$). Correct the result for any added substances containing calcium.

Storage—Preserve Calcium Gluconate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Calcium Gluconate Injection usually available contains the following amount of calcium gluconate: 1 Gm. (15 grains) in 10 cc.

AVERAGE DOSE OF CALCIUM GLUCONATE—Intramuscular or intravenous, Metric, 1 Gm.—Apothecaries, 15 grains.

INJECTIO DEXTROSI

Dextrose Injection

Inj. Dextros.—Dextrose Ampuls

Dextrose Injection is a sterile solution of dextrose in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of dextrose ($C_6H_{12}O_6.H_2O$), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Dextrose Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219, but bacteriostatic agents must not be added.

Identification—Dextrose Injection responds to the *identification test* under *Dextrosum*, page 149.

Heavy metals—Evaporate a volume of Dextrose Injection, equivalent to 3 Gm. of dextrose, in a porcelain dish or crucible, to dryness on a steam bath, then thoroughly char the residue. Cool, add a mixture of 30 cc. of diluted hydrochloric acid and 3 cc. of bromine T.S., cover the dish, and boil gently for 10 minutes. Filter, and wash the filter and residue with 25 cc. of hot distilled water. Evaporate the filtrate to a volume of about 15 cc., cool, and add ammonia T.S., dropwise, until the solution is neutral to litmus paper, then add 2 cc. of diluted acetic acid, dilute to 25 cc. with distilled water, and add 10 cc. of hydrogen sulfide T.S. The resulting color, if any, is not darker than that of a control made in the same manner with the same quantities of the reagents and to which 1.5 cc. of standard lead solution, page 586, has been added, the solutions being compared in matched Nessler tubes.

Assay—Transfer an accurately measured volume of Dextrose Injection, containing 2 to 5 Gm. of dextrose, to a 100-cc. volumetric flask. Add a few drops of ammonia T.S., dilute with distilled water to exactly 100 cc., and mix well, then, after 30 minutes, determine the angular rotation in a 200-mm. tube at 25° C. The observed rotation in degrees, multiplied by 1.0425, represents the weight of dextrose ($C_6H_{12}O_6 \cdot H_2O$) in 100 cc. of the dilution.

Pyrogens—Dextrose Injection, diluted, if necessary, with water for injection to contain 5 per cent of dextrose, meets the requirements of the *Pyrogen Test*, page 606.

Storage—Preserve Dextrose Injection preferably in single dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

INJECTIO DEXTROSI ET SODII CHLORIDI

Dextrose and Sodium Chloride Injection

Inj. Dextros. et Sod. Chlorid.—Dextrose and Sodium Chloride Ampuls

Dextrose and Sodium Chloride Injection is a sterile solution of dextrose and sodium chloride in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of dextrose ($C_6H_{12}O_6 \cdot H_2O$) and of sodium chloride (NaCl), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Caution—*The sodium chloride content in this Injection is generally of high concentration. Dextrose and Sodium Chloride Injection containing a sodium chloride concentration corresponding to the sodium chloride content of isotonic solution of sodium chloride is to be labeled "Dextrose Injection in Isotonic Solution of Sodium Chloride."* See *Labeling*, page 221.

Sterilize Dextrose and Sodium Chloride Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—The Injection responds to the *identification test* under *Dextrosum*, page 149, and to the tests for sodium, page 592, and for chloride, page 589.

Heavy metals—Evaporate a volume of Dextrose and Sodium Chloride Injection, equivalent to 3 Gm. of the total solids, to dryness on a steam bath in a porcelain dish or crucible, then proceed as described in the test for *heavy metals* under *Injectio Dextrosi*, page 226, beginning with "then thoroughly char the residue."

Assay for dextrose—Transfer an accurately measured volume of Dextrose and Sodium Chloride Injection, containing 2 to 5 Gm. of dextrose, to a 100-cc. volumetric flask. Add a few drops of ammonia T.S., dilute with distilled water to exactly 100 cc., and mix well, then, after 30 minutes, determine the angular rotation in a 200-mm. tube at 25° C. The observed rotation in degrees, multiplied by 1.0425, represents the weight of dextrose ($C_6H_{12}O_6 \cdot H_2O$) in 100 cc. of the dilution.

Assay for sodium chloride—Transfer an accurately measured volume of the Injection, equivalent to about 0.2 Gm. of sodium chloride, to a 200-cc. volumetric flask. Add, while agitating, 50 cc. of tenth-normal silver nitrate, then add 5 cc. of nitric acid and sufficient distilled water to make 200 cc., and mix well. Filter

through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Titrate the excess of silver nitrate in exactly 100 cc. of the subsequent filtrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.005845 Gm. of NaCl.

Pyrogens—Dextrose and Sodium Chloride Injection, diluted, if necessary, with water for injection to contain not more than 0.9 per cent of sodium chloride and not more than 5 per cent of dextrose, meets the requirements of the *Pyrogen Test*, page 606.

Storage—Preserve Dextrose and Sodium Chloride Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

INJECTIO DIGITALIS

Digitalis Injection

Inj. Digit.—Digitalis Ampuls

Digitalis Injection is a sterile solution of one or more of the glycosides or therapeutically desirable and cardio-active constituents of digitalis in water for injection. Its potency is to be indicated on the label in terms of U. S. P. Digitalis Units. Digitalis Injection meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Digitalis Injection preferably by Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Assay—Proceed as directed under *Tinctura Digitalis*, page 510.

Storage—Preserve Digitalis Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Digitalis injection usually available contains the following equivalent of digitalis: 1 U. S. P. Unit in 1 cc.

AVERAGE DOSE OF DIGITALIS—Intravenous, 1 U. S. P. Unit.

INJECTIO EMETINÆ HYDROCHLORIDI

Emetine Hydrochloride Injection

Inj. Emet. Hydrochlor.—Emetine Hydrochloride Ampuls

Emetine Hydrochloride Injection is a sterile solution of emetine hydrochloride in water for injection. It contains an amount of anhydrous emetine hydrochloride ($C_{29}H_{40}N_2O_4 \cdot 2HCl$) equivalent to not less than 84 per cent and not more than 94 per cent of the labeled amount of emetine hydrochloride, including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

In preparing the Injection, adjust it with hydrochloric acid or with sodium carbonate to a pH of about 3.5.

Sterilize Emetine Hydrochloride Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—Evaporate 1 cc. of the Injection to dryness on a steam bath. The residue responds to *identification test B* under *Emetinæ Hydrochloridum*, page 156.

The Injection also responds to *identification tests A and C* under *Emetinæ Hydrochloridum*, page 156.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, with distilled water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 0.12 Gm. of emetine hydrochloride, to a separator or to a continuous extraction apparatus. Render the solution strongly alkaline with ammonia T.S., and extract the alkaloid completely with ether until 0.5 cc. of the aqueous layer, slightly acidulated with hydrochloric acid, remains unaffected by the addition of a few drops of mercuric potassium iodide T.S. Evaporate the combined ether extracts on a water bath, allowing the last few cc. of the ether to evaporate spontaneously. Add to the residue 2 cc. of neutral alcohol and exactly 30 cc. of fiftieth-normal sulfuric acid, and warm gently until the alkaloid is dissolved. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.005536 Gm. of anhydrous emetine hydrochloride ($C_{29}H_{40}N_2O_4 \cdot 2HCl$).

Storage—Preserve Emetine Hydrochloride Injection preferably in single-dose, hermetic containers or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Emetine Hydrochloride Injection usually available contains the following amounts of emetine hydrochloride: 20 mg. ($\frac{1}{3}$ grain) in 1 cc.; 30 mg. ($\frac{1}{2}$ grain) in 1 cc.; 60 mg. (1 grain) in 1 cc.

AVERAGE DOSE OF EMETINE HYDROCHLORIDE—Intramuscular,
Metric, 60 mg.—Apothecaries, 1 grain.

INJECTIO EPINEPHRINÆ HYDROCHLORIDI

Epinephrine Hydrochloride Injection

Inj. Epineph. Hydrochlor.—Epinephrine Hydrochloride Ampuls

Epinephrine Hydrochloride Injection is a sterile solution of epinephrine hydrochloride in water for injection. Its potency shall be stated on the label of the container in terms of the quantity of U. S. P. Epinephrine Reference Standard to which it is equivalent. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Epinephrine Hydrochloride Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—The Injection responds to the *identification test* under *Liquor Epinephrinæ Hydrochloridi*, page 266.

Assay—Proceed as directed under *Liquor Epinephrinæ Hydrochloridi*, page 266.

NOTE—Evidence of potency within 5 per cent below and 5 per cent above the standard is acceptable.

Storage—Preserve Epinephrine Hydrochloride Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Epinephrine Hydrochloride Injection is usually available containing the following amounts of epinephrine hydrochloride: 1 cc. of 1-1000 solution; 10 cc. of 1-1000 solution; 30 cc. of 1-1000 solution.

AVERAGE DOSE OF EPINEPHRINE HYDROCHLORIDE—Subcutaneous or intramuscular, Metric, 1 mg.—Apothecaries, $\frac{1}{60}$ grain.

INJECTIO HEPATIS

Liver Injection

Inj. Hepat.—Liquor Hepatis Purificatus U. S. P. XI, Liver Extract for Parenteral Use

Liver Injection is a sterile solution in water for injection of that soluble thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood of persons suffering from pernicious anemia. The approximate anti-anemia potency of Liver Injection upon parenteral administration in pernicious anemia is expressed in U. S. P. Units and conforms to all other provisions given under *Anti-anemia Preparations*, page 553. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Liver Injection preferably by Process F. See *Sterilization Processes*, page 614.

Liver Injection must not contain more than 0.5 per cent of cresol or of phenol if either is used as a bacteriostatic agent and is exempt from the regulations concerning the volume requirement for multiple dose containers given on page 220.

The Injection also conforms to the other requirements under *Injections*, page 219.

Storage—Preserve Liver Injection preferably in single-dose hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567. Preserve the Injection preferably at a temperature not above 20° C. and protected from light.

Sizes—Liver Injection is usually available containing the following U. S. P. Units: 2 U. S. P. Units in 1 cc.; 5 U. S. P. Units in 1 cc.; 10 U. S. P. Units in 1 cc.; 15 U. S. P. Units in 1 cc.

AVERAGE DAILY DOSE OF LIVER—Intramuscular, 1 U. S. P. Unit.

INJECTIO HISTAMINÆ PHOSPHATIS

Histamine Phosphate Injection

Inj. Histamin. Phos.—Liquor Histaminæ Phosphatis U. S. P. XI, Solution of Histamine Phosphate U. S. P. XI, Histamine Acid Phosphate Injection

Histamine Phosphate Injection is a sterile solution of histamine phosphate in water for injection. It meets the requirements of the *Sterility Test for Liquids*, page 609.

HISTAMINE PHOSPHATE.....	1 Gm.
WATER FOR INJECTION, a sufficient quantity,	
To make.....	1000 cc.

Prepare a solution, filtering it, if necessary, until clear.

Sterilize Histamine Phosphate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Description—Histamine Phosphate Injection is a colorless or nearly colorless, slightly acid liquid.

Identification—Histamine Phosphate Injection meets the requirements of the *identification tests* under *Histaminæ Phosphas*, page 209.

Storage—Preserve Histamine Phosphate Injection preferably in hermetic containers or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Histamine Phosphate Injection usually available contains the following amount of histamine phosphate: 1 mg. ($\frac{1}{60}$ grain) in 1 cc.

AVERAGE DOSE OF HISTAMINE PHOSPHATE—Intramuscular,
Metric, 0.3 mg.—Apothecaries, $\frac{1}{200}$ grain.

INJECTIO HYDRARGYRI SALICYLATIS

Mercuric Salicylate Injection

Inj. Hydrarg. Salicyl.—Mercuric Salicylate Ampuls

Mercuric Salicylate Injection is a sterile suspension of mercuric salicylate in a suitable fixed oil. It contains an amount of mercury (Hg) equivalent to not less than 52.5 per cent and not more than 61 per cent of the labeled amount of mercuric salicylate, including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Mercuric Salicylate Injection preferably by Process E at a temperature not exceeding 65° C. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—Transfer to a dry filter a sufficient volume of the Injection to yield about 1 Gm. of mercuric salicylate, wash it with purified benzin until the oil is removed, and allow the benzin to evaporate from the filter. The residue responds to *identification tests A and B* under *Hydrargyri Salicylas*, page 213.

Assay—Shake thoroughly the contents of the cylinder obtained in the *Determination of the Volume of Injection in Containers*, and at once transfer with a pipette, calibrated to contain an accurately measured volume of the suspension, equivalent to about 0.5 Gm. of mercuric salicylate, to a dry filter, washing out the pipette with a small quantity of purified benzin and adding the washings to the Injection on the filter. Wash the Injection with purified benzin to remove all of the oil, and allow the purified benzin to evaporate from the filter. Place the filter and contents in a Kjeldahl flask, add 15 cc. of sulfuric acid, and follow in about 10 minutes with 15 cc. of nitric acid, adding the nitric acid slowly and while rotating the contents of the flask. Insert a small funnel in the neck of the flask, and heat on a sand bath until a colorless or practically colorless solution results. Cool the solution, cautiously dilute with 150 cc. of distilled water, cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of mercury (Hg).

Storage—Preserve Mercuric Salicylate Injection preferably in single-dose hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Mercuric Salicylate Injection usually available contains the following amounts of mercuric salicylate: 60 mg. (1 grain) in 1 cc.; 0.1 Gm. (1½ grains) in 1 cc.; 0.12 Gm. (2 grains) in 1 cc.

AVERAGE DOSE OF MERCURIC SALICYLATE—Intramuscular, Metric, 0.1 Gm.—Apothecaries, 1½ grains.

INJECTIO INSULINI

Insulin Injection

Inj. Insulin.—Insulin, Insulin Hydrochloride

Insulin Injection is an acidified aqueous solution of the active principle of the pancreas which affects the metabolism of glucose. Insulin Injection, when assayed as directed, shall possess a potency of not less than 95 per cent and not more than 105 per cent of the potency stated on the label, and the potency shall be expressed in U. S. P. Insulin Units which are equivalent in potency to the Unit declared on the label of the container of the U. S. P. *Zinc-Insulin Crystals Reference Standard*.

Insulin Injection is so standardized that each cc. contains either 20, 40, 80, or 100 U. S. P. Insulin Units.

Insulin Injection meets the requirements of the *Sterility Test for Liquids*, page 609.

The label of the Insulin Injection container must state the potency in U. S. P. Insulin Units per cc. and the outside labeling of each retail package shall also state a date of expiration which must not be later than two years after the date of its removal for distribution from the manufacturer's place of storage, the temperature of which shall be above 0° C. but shall not exceed 15° C.

Insulin Injection must contain from 0.1 to 0.25 per cent (w/v) of either phenol or cresol. The solution must contain from 1.4 to 1.8 per cent (w/v) of glycerin.

Description—Insulin Injection is a colorless or almost colorless liquid, free from turbidity and from insoluble matter.

Identification—Inject subcutaneously into six rabbits, from which food has been withheld for the previous 18 to 24 hours and which weigh from 1.8 to 2.2 Kg. each, a quantity of Insulin Injection which causes convulsions in at least three animals. Immediately after convulsions occur in an animal, inject intravenously into that animal 5 cc. of a 50 per cent aqueous solution of dextrose. The convulsion is relieved and a majority of the animals which have shown convulsions remain alive for at least 3 days.

Adjust the acidity of Insulin Injection to a pH between 5.1 and 5.3: a precipitate forms which dissolves when the reaction is adjusted to a pH between 2.5 and 3.5. Insulin Injection shows, at most, only a slight haze when adjusted to a pH between 8.0 and 8.5.

Reaction—The pH of Insulin Injection is between 2.5 and 3.5, employing a glass electrode.

Determine from the label of the container the quantities of Insulin Injection sufficient to make the tests which follow for total nitrogen, zinc, and ash.

Total nitrogen—Transfer a quantity of Insulin Injection, representing not less than 200 U. S. P. Insulin Units, to a Kjeldahl flask of suitable capacity. Determine the total nitrogen, Method I, page 598, but use 15 cc. of fiftieth-normal acid and titrate with fiftieth-normal alkali. The total volume of the titration solutions and washings must not exceed 300 cc. Titrate to a distinct yellow color, using methyl red T.S. as the indicator. Perform a blank determination with the same reagents and in the same manner, and make any necessary correction. The quantity of nitrogen found does not exceed 0.85 mg. for each 100 Units of Insulin Injection.

Zinc—When tested as directed under *Zinc in Insulin Injection*, page 643, the zinc content of Insulin Injection shall not exceed 0.4 mg. in each 1000 U. S. P. Insulin Units.

Ash—Concentrate slowly in a tared platinum dish an amount of Insulin Injection equivalent to not less than 500 U. S. P. Insulin Units. When dry, add to the residue 2 drops of nitric acid, and ignite at first very gently over a Bunsen flame, then gradually raise the temperature until the carbon which may appear is completely dissipated. Place in a muffle furnace at dull red to medium red heat for 15 minutes. Cool the dish and contents in a desiccator, and weigh. The ash so obtained corresponds to not more than 1.0 mg. per 1000 U. S. P. Insulin Units.

Assay—Insulin Injection is assayed by comparing its ability to lower the blood-sugar of rabbits with that of the U. S. P. Zinc-Insulin Crystals Reference Standard.

Standard solution—Dissolve an accurately weighed sample of U. S. P. Zinc-Insulin Crystals Reference Standard in sufficient distilled water containing between 0.1 and 0.25 per cent (w/v) of either phenol or cresol, between 1.4 and 1.8 per cent (w/v) of glycerin, and sufficient hydrochloric acid to make a standard solution containing 20 U. S. P. Insulin Units per cc. and having a pH between 2.5 and 3.5. Store in a cold place protected from freezing until used. Do not use after six months.

Test animal—Select for assay purposes healthy rabbits weighing at least 1.5 Kg. and otherwise suitable. Keep the animals in the laboratory at least one week

before use in a test, and feed an adequate, uniform diet, with water available at all times. Mark the rabbits for identification, and use them at intervals of not less than 6 days as long as they remain suitable.

Dilution of the standard solution—Dilute the standard solution to contain a known concentration, not less than 1.25 and not more than 2.5, of U. S. P. Insulin Units per cc., using a distilled water solution of between 0.1 and 0.25 per cent (w/v) of either phenol or cresol, between 1.4 and 1.8 per cent (w/v) of glycerin, and sufficient hydrochloric acid to produce a pH of from 2.5 to 3.5.

Volume of the dilution of the standard solution to be injected—The volumes of the solution injected should be sufficiently great to provide that at the time of the final bleeding the average blood-sugar level shall not be greater than approximately 90 per cent of the average initial value; but the volumes of the solution injected shall not be so great that convulsions are caused in more than 25 per cent of the animals. For each animal the volume of the dilution of the standard solution to be injected shall be identical with the volume of the dilution of the preparation to be assayed.

Dilution of the preparation to be assayed—Determine the approximate potency of the preparation to be assayed. Employ the same diluent used in preparing the dilution of the standard solution to make three dilutions of the preparation to be assayed to contain the same number of U. S. P. Insulin Units per cc. as the dilution of the standard solution on the basis of the following assumptions: (a) That the sample contains 89.3 per cent of the approximate potency (Dilution 1); (b) that the sample contains 100 per cent of the approximate potency (Dilution 2); (c) that the sample contains 112 per cent of the approximate potency (Dilution 3).

Conduct of the assay—Divide the rabbits into six groups of at least three rabbits each. Place the rabbits in individual cages, and withhold all food, except water, for approximately 24 hours before the test. Weigh the rabbits on the morning of the day of the test and deprive them of water until after the final blood sample has been taken. Handle the rabbits with care in order to avoid any undue excitement. Obtain for the determination of the initial blood-sugar level slightly more than 1 cc. of blood from a small incision in the marginal vein of the ear. Collect the blood in a suitable vessel containing about 3 mg. of sodium oxalate. After obtaining this sample of blood for the determination of the initial blood-sugar concentration, inject subcutaneously the dose of the appropriate solution.

The plan of injection shall be as follows:

Group	Solutions to be injected
1	Dilution of the standard solution
2	Dilution 1 of the preparation to be assayed
3	Dilution of the standard solution
4	Dilution 2 of the preparation to be assayed
5	Dilution of the standard solution
6	Dilution 3 of the preparation to be assayed

About one week later inject the same volumes into the same animals as follows:

Group	Solutions to be injected
1	Dilution 1 of the preparation to be assayed
2	Dilution of the standard solution
3	Dilution 2 of the preparation to be assayed
4	Dilution of the standard solution
5	Dilution 3 of the preparation to be assayed
6	Dilution of the standard solution

At 1½, 3, and at a time between 4 and 5½ hours from the time of injection, obtain samples of blood from each rabbit in the manner followed for the determination of the initial blood-sugar concentration. Using at least eighteen rabbits in each of the six groups of the plan described above, determine the relationship of each of the three dilutions of the preparation to be assayed to the dilution of the standard solution.

Blood-sugar determination—Take 1 cc. of the blood obtained as directed in the assay for Insulin Injection with 8 cc. of acid zinc sulfate solution, prepared as directed below, in a clean, dry flask or test tube, and add 1 cc. of a solution prepared by mixing 81 cc. of normal sodium hydroxide with sufficient distilled water to make 100 cc. Stopper, shake vigorously, allow to stand for a few minutes, and then filter through a dry filter into a clean, dry vessel. Accurately measure from 2 to 5 cc. of the filtrate into exactly 5 cc. of alkaline cupric iodide T.S., contained in a 25- by 200-mm. test tube. Mix gently, close the tube with a glass bulb or other suitable loose stopper or cover, and place in a metal rack so constructed as to prevent agitation of the tubes while in the bath of boiling water. Immerse the rack and tubes to a depth of about 10 cm. in the boiling water for 20 minutes. Cool rapidly to about 30° C. by immersion in water, avoiding agitation. Acidify with 5 cc. of normal sulfuric acid, mix gently, allow to stand for at least 1 minute, and then titrate with two-hundredth-normal sodium thiosulfate, prepared on the day it is used. When the iodine color becomes quite pale, 1 cc. of starch T.S. may be added to facilitate the determination of the end-point. Perform a blank test with the same quantities of the reagents and in the same manner, replacing the blood filtrate with a corresponding amount of distilled water. The difference between the number of cc. of thiosulfate consumed by the blank and by the blood filtrate, multiplied by 113 and divided by the number of cc. of blood filtrate used in the test, indicates the blood-sugar value in mg. in each 100 cc.

Acid Zinc Sulfate Solution—Dissolve 12.5 Gm. of zinc sulfate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$) in about 200 cc. of distilled water, add 31.25 cc. of normal sulfuric acid and sufficient distilled water to make exactly 1000 cc., and mix well. Measure accurately 50 cc. of the solution so prepared, add 3 drops of phenolphthalein T.S., and, with continuous stirring, slowly titrate with sodium hydroxide solution, made by mixing exactly 81 cc. of normal sodium hydroxide with sufficient distilled water to make 100 cc., until a permanent pink color is produced: not less than 6.2 cc. and not more than 6.30 cc. of the sodium hydroxide solution is required.

Interpretation of the data—From the initial blood-sugar concentration subtract the average of the concentration observed at the three bleeding times subsequent to the injection, and express the difference as the percentage of the initial concentration. Combine all of the percentages obtained from the rabbits which received the same dilution of the preparation to be assayed in such a way that the index of the relative effect of the dilution of the preparation to be assayed, compared with that of the dilution of the standard solution, can be calculated by the following formula:

$$\text{Index} = \frac{\text{Average percentage reduction effected by the dilution of the preparation to be assayed}}{\text{Average percentage reduction effected by the dilution of the standard solution}} \times 100$$

Calculate the index for each of the three dilutions of the preparation to be assayed. Determine graphically the potency of the preparation to be assayed by plotting three points on a graph, using each index as the ordinate and the corresponding assumed potency in U. S. P. Insulin Units in each cc. as the abscissa. The potency in U. S. P. Insulin Units in each cc. of the preparation to be assayed is indicated by the abscissa of the point of intersection of the line of best fit with a horizontal extended from the ordinate of 100.

Should the results indicate that the potency of the preparation to be assayed lies outside of the limits of the assumed potencies, make other assumptions and repeat the assay until the observed potency is within the range of assumed potencies.

Storage—Preserve Insulin Injection at a temperature above 0° C. but not exceeding 15° C., avoiding freezing. It must be dispensed in a satisfactory unopened multiple-dose container in which it was placed by the manufacturer, which container shall be of 10-cc. capacity. See *General Notices, The Container*, page 6.

AVERAGE DOSE—Insulin Injection is administered by injection usually into the loose subcutaneous tissue. At times it is administered intravenously. The dose of insulin is to be determined by the physician in accordance with the needs of the patient.

INJECTIO MERCUROPHYLLINÆ

Mercurophylline Injection

Inj. Mercurophyll.

Mercurophylline Injection is a sterile solution in water for injection of the sodium salt of β -methoxy- γ -hydroxymercuri propylamide of trimethyl cyclopentane dicarboxylic acid ($C_{14}H_{28}NO_5HgNa$) (the mercuri compound) and of theophylline in approximately molecular proportions. It contains an amount of mercury equivalent to not less than 37 per cent and not more than 42 per cent of the labeled amount of the mercuri compound, and not less than 93 per cent and not more than 107 per cent of the labeled amount of theophylline ($C_7H_8N_4O_2 \cdot H_2O$). It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Mercurophylline Injection preferably by Process D. See *Sterilization Processes*, page 614

The Injection conforms to the other requirements under *Injectiones*, page 219.

Description—Mercurophylline Injection is a clear, faintly yellow, odorless liquid and has a slightly alkaline reaction (pH about 8.0 to 9.0).

Identification—

- A: To a volume of Mercurophylline Injection equivalent to about 0.2 Gm. of the mercuri compound, add 6 cc. of a mixture of 1 cc. of glacial acetic acid, 9 cc. of distilled water, and 0.5 Gm. of ammonium chloride. Heat the mixture on a steam bath, and bubble hydrogen sulfide through the solution: a black precipitate of mercuric sulfide is formed. Continue passing hydrogen sulfide until no more precipitate is formed, then filter while hot, and place the filtrate in a refrigerator over night. Filter, and wash the crystals with a small quantity of ice-cold distilled water, and dry at about 80° C.: the crystals so obtained melt between 157° and 159° C.
- B: Add 1 cc. of hydrochloric acid and 0.1 Gm. of potassium chlorate to a volume of the Injection, equivalent to about 10 mg. of theophylline, contained in a porcelain dish; evaporate to dryness on a steam bath, and invert the dish over a vessel containing some ammonia T.S.: the residue acquires a purple color which is destroyed by alkali.
- C: Evaporate a volume of the Injection, equivalent to about 0.1 Gm. of the mercuri compound, to dryness in a porcelain crucible, and ignite: the resulting residue is alkaline to moistened litmus paper, effervesces with acid, and responds to the flame test for sodium.

Mercury ions—To a volume of the Injection, equivalent to about 0.2 Gm. of the mercuripurin compound, add 0.5 cc. of sodium sulfite T.S.: no color deeper than yellow is observed and no precipitate is formed.

Assay for mercury—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, equivalent to about 0.2 Gm. of the mercuri compound, into a Kjeldahl flask. Cautiously add 8 cc. of sulfuric acid, insert a small funnel into the neck of the flask, then add slowly 10 cc. of nitric acid. Heat the mixture, at first gently, then more strongly, until the solution is colorless or only slightly yellow, adding more nitric acid if necessary, and keeping the funnel in neck of the flask during the heating. Allow the solution to cool sufficiently, and cautiously add through the funnel about 50 cc. of cold, distilled water, rinsing the stem of the funnel with a few cc. of the water and allowing the rinsings to run into the flask. Add potassium

permanganate T.S. to the warm solution, dropwise, until a slight pink color persists. Discharge the pink color by the addition of just sufficient oxalic acid T.S. Cool the solution, add 3 cc. of nitric acid and 2 cc. ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

Assay for theophylline—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, equivalent to about 0.15 Gm. of theophylline, to a flask, add 10 cc. of distilled water and 5 cc. of ammonia T.S., then add 15 cc. of tenth-normal silver nitrate, and allow to stand for 1 hour. Filter, and wash the precipitate with several 10-cc. portions of distilled water. Neutralize the combined filtrate and washings with nitric acid, then add 3 cc. more of the acid, and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.01982 Gm. of $C_7H_8N_4O_2 \cdot H_2O$.

Storage—Preserve Mercurophylline Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Mercurophylline Injection usually available contains the following amounts of the mercuri compound and of theophylline: mercuri compound 0.1 Gm. ($1\frac{1}{2}$ grain) and theophylline 40 mg. ($\frac{3}{4}$ grain) in 1 cc.; mercuri compound 0.2 Gm. (3 grains) and theophylline 80 mg. ($1\frac{1}{2}$ grains) in 1 cc.

AVERAGE DOSE OF MERCUROPHYLLINE—Intramuscular, an amount equivalent to:

	Metric	Apothecaries
The mercuri compound	0.1 Gm.	$1\frac{1}{2}$ grains
Theophylline	40 mg.	$\frac{3}{4}$ grain

INJECTIO MERSALYLIS ET THEOPHYLLINÆ

Mersalyl and Theophylline Injection

Inj. Mersal. et Theophyll.—Mersalyl and Theophylline Ampuls

Mersalyl and Theophylline Injection is a sterile solution in water for injection of approximately 10 parts by weight of mersalyl ($C_{13}H_{16}HgNO_6Na$) to each 5 parts by weight of theophylline ($C_7H_8N_4O_2 \cdot H_2O$). It contains mercury (Hg) equivalent to not less than 37 per cent and not more than 42 per cent of the labeled amount of mersalyl, and not less than 93 per cent and not more than 107 per cent of the labeled amount of theophylline. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Mersalyl and Theophylline Injection preferably by Process A. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—

A: To 5 cc. of Mersalyl and Theophylline Injection add 3 cc. of formic acid: a white precipitate is formed which, on being boiled, dissolves, leaving a gray residue of metallic mercury. Add 10 cc. of hot distilled water to the mixture, filter through a small filter paper, and cool the filtrate. Collect the crystals on a small filter, wash them four times with 5-cc. portions of distilled water, allow to drain, and dry the crystals over sulfuric acid for 24 hours: the crystals melt between 119° and 122° C.

B: Combine the filtrate and washings from the crystals obtained in test A, and bubble hydrogen sulfide through the solution for 10 minutes. Filter, evaporate the filtrate to a volume of about 20 cc., and cool. Transfer the cold solution to a small separator, add 10 Gm. of sodium acetate, and extract with three successive, 10-cc. portions of chloroform. Evaporate the combined chloroform extracts nearly to dryness, and dry over sulfuric acid for 24 hours: the residue melts between 270° and 274° C., and responds to the *identification test A* under *Theophyllina*, page 497.

C: The precipitate of metallic mercury obtained in test A, when dissolved in a few drops of hot nitric acid, responds to the test for mercury, page 591.

Reaction—One drop of Mersalyl and Theophylline Injection produces a blue color with 1 drop of bromothymol blue T.S., and a full yellow color with 1 drop of thymol blue T.S., corresponding to a pH of not less than 7.6 and not greater than 8.0.

Mercuric ion—To 5 cc. of Mersalyl and Theophylline Injection add 0.5 cc. of diluted acetic acid and 0.3 cc. of sodium sulfide T.S.: only a very faint coloration of the solution is noticeable immediately.

Assay for mercury—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, equivalent to about 0.2 Gm. of mersalyl, into a Kjeldahl flask. Cautiously add 8 cc. of sulfuric acid, insert a small, short-stemmed funnel into the neck of the flask, and add 10 cc. of nitric acid. Heat the mixture gently until frothing ceases, and then more strongly until the solution is colorless or nearly so. Add more nitric acid during the digestion if necessary, and keep the funnel in the neck of the flask during digestion. Allow the solution to cool, and cautiously add through the funnel about 50 cc. of cold distilled water. Rinse the funnel and the neck of the flask with a few cc. of distilled water, receiving the rinsings in the flask. Add potassium permanganate T.S., dropwise, to the warm solution until a slight pink color persists, and discharge the pink color with the aid of just sufficient oxalic acid T.S., added dropwise. Cool the solution, add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

Assay for theophylline—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, equivalent to about 0.2 Gm. of theophylline, to a 200-cc. Erlenmeyer flask, add 1 cc. of sulfuric acid and 50 cc. of distilled water, and bubble hydrogen sulfide through the solution until no more precipitate is formed. Boil the solution gently until no more hydrogen sulfide is expelled, filter while hot, and wash the flask and filter with five 10-cc. portions of hot distilled water. To the combined filtrate and washings add 5 Gm. of ammonium acetate and exactly 20 cc. of tenth-normal silver nitrate. Evaporate the mixture on a steam bath to a volume of about 50 cc., and filter through a filtering crucible while still warm. Wash the vessel and filter with three 10-cc. portions of hot distilled water, add 5 cc. of nitric acid to the combined filtrate and washings, and allow to cool to room temperature. Titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.01982 Gm. of $C_7H_8N_4O_2 \cdot H_2O$.

Storage—Preserve Mersalyl and Theophylline Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Mersalyl and Theophylline Injection usually available contains the following amounts of mersalyl and theophylline: Mersalyl—0.1 Gm. ($1\frac{1}{2}$ grains) and Theophylline—50 mg. ($\frac{3}{4}$ grain) in 1 cc.

AVERAGE DOSE OF MERSALYL AND THEOPHYLLINE—Intramuscular, an amount equivalent to:

	Metric	Apothecaries
Mersalyl	0.2 Gm.	3 grains
Theophylline	0.1 Gm.	$1\frac{1}{2}$ grains

INJECTIO NEOSTIGMINÆ METHYLSULFATIS

Neostigmine Methylsulfate Injection

Inj. Neostig. Methylsulf.—Neostigmine Methylsulfate Ampuls

Neostigmine Methylsulfate Injection is a sterile solution of neostigmine methylsulfate in water for injection. It contains not less than 90 per cent and not more than 110 per cent of the labeled amount of neostigmine methylsulfate ($C_{13}H_{22}N_2O_6S$), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Neostigmine Methylsulfate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—Evaporate, if necessary, a volume of the Injection to a concentration of 1 mg. in 2 cc., then place the liquid in a small porcelain dish, add 0.5 cc. of an aqueous solution of sodium hydroxide (2 in 5), and proceed as directed in the *identification tests* under *Neostigminæ Methylsulfas*, page 305.

Assay—Transfer an accurately measured volume of Neostigmine Methylsulfate Injection, equivalent to at least 30 mg. of neostigmine methylsulfate, to a Kjeldahl flask connected by means of a suitable trap with a well-cooled condenser, and add distilled water to make the total volume about 200 cc. Add 30 cc. of sodium hydroxide solution (1 in 10), and distil, receiving the distillate in a flask containing exactly 15 cc. of fiftieth-normal sulfuric acid. Continue the distillation until the distillate measures about 200 cc. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.006688 Gm. of neostigmine methylsulfate ($C_{13}H_{22}N_2O_6S$).

Storage—Preserve Neostigmine Methylsulfate Injection preferably in single-dose, hermetic containers or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Neostigmine Methylsulfate Injection usually available contains the following amounts of neostigmine methylsulfate: 1 cc. of 1-4000 solution = 0.25 mg. ($\frac{1}{250}$ grain); 1 cc. of 1-2000 solution = 0.5 mg. ($\frac{1}{200}$ grain).

AVERAGE DOSE OF NEOSTIGMINE METHYLSULFATE—Intramuscular, Metric, 0.5 mg.—Apothecaries, $\frac{1}{200}$ grain.

INJECTIO OUABAINI

Ouabain Injection

Inj. Ouabain.—Ouabain Ampuls

Ouabain Injection is a sterile solution of ouabain in water for injection. Its potency shall be stated on the label of the container in terms of the quantity of U. S. P. Ouabain Reference Standard to which it is equivalent. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Ouabain Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Assay—Proceed as directed under *Strophanthinum*, page 434.

Storage—Preserve Ouabain Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Ouabain Injection usually available contains the following amounts of Ouabain: 0.25 mg. ($\frac{1}{250}$ grain) in 1 cc.; 0.5 mg. ($\frac{1}{120}$ grain) in 1 cc.

AVERAGE DOSE OF OUABAIN—Intravenous, Metric 0.25 mg.—Apothecaries, $\frac{1}{250}$ grain.

INJECTIO PARATHYROIDEI

Parathyroid Injection

Inj. Parathyroid.—Liquor Parathyroidei U. S. P. XI, Solution of Parathyroid, Parathyroid Extract

Parathyroid Injection is a sterile solution in water for injection of the water-soluble principle or principles of the parathyroid glands which have the property of relieving the symptoms of parathyroid tetany and of increasing the calcium content of the blood serum in man and other animals. It is obtained from the fresh parathyroid glands of healthy domesticated animals used for food by man, the animal source of each preparation being stated. The parathyroid glands must be removed from the animals immediately after slaughtering, and then extracted at once or kept frozen until extracted. The glands are freed from gross fat and connective tissue, ground, extracted, and the extract purified to make it suitable for parenteral administration. The Injection is then adjusted to the proper potency. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Parathyroid Injection preferably by Process F. See *Sterilization Processes*, page 614.

One cc. of Parathyroid Injection possesses a potency of not less than 100 U. S. P. Parathyroid Units, each Unit representing one one-hundredth of the amount required to raise the calcium content of 100 cc. of the blood serum of normal dogs 1 mg. within 16 to 18 hours after administration.

The Injection also conforms to the other requirements under *Injections*, page 219.

Assay—Select male dogs free from gross evidence of disease and accustomed to venipuncture, but which have not been used during the previous 4 weeks for the purposes of this assay. The dogs shall be mature, as determined by the presence of their second teeth, and shall weigh between 8 and 16 Kg., except that no two dogs selected shall differ in weight by more than 5 Kg. On account of individual variation in reaction, a group of not less than ten dogs is to be employed in each test. During the assay, maintain the dogs under similar conditions with respect to diet and environmental influences.

Select, by preliminary trial, a dose of the preparation to be assayed such that its injection will be expected to produce increases in the serum calcium contents of the dogs selected of not less than 2 and not more than 5 mg. per 100 cc. of serum.

Withdraw a blood sample from each dog, taking precautions to avoid exciting the dog and thereby elevating the serum calcium level. In obtaining the blood samples, use a clean, dry syringe containing no anti-coagulant. Transfer the blood immediately to a centrifuge tube, and allow the blood to clot. Free the clot with a glass rod, and centrifuge sufficiently to yield the serum as a clear supernatant layer which may be siphoned off by suitable means. It may be necessary to recentrifuge the serum after its separation from the clot in order to insure the removal of all cellular material. Determine the serum calcium by the method indicated below.

Inject subcutaneously into each dog the selected dose of the Injection to be tested. Between 16 and 18 hours after the injection again withdraw a blood sample, observing the same precautions, and determine the serum calcium as indicated.

Determine for each dog the increase in serum calcium (expressed in mg. per 100 cc. of serum) per cc. of preparation injected, and determine the average of these values for all of the animals injected. The potency of the preparation is satisfactory if the average of the ten or more values so obtained is not less than 1 mg. of calcium per 100 cc. of serum, per 1 cc. of the Injection.

Determination of serum calcium—Perform this determination in duplicate. Place 2 cc. of clear serum into a graduated 15-cc. conical centrifuge tube that has very recently been thoroughly cleaned with chromic acid cleansing mixture, page 566. Add 2 cc. of distilled water and 1 cc. of ammonium oxalate T.S., dropping the latter directly into the solution and not allowing it to touch the lip or sides of the tube. Mix thoroughly by giving the tube a quick, jerky, whirling motion. Stopper the tube, and allow it to stand for 30 minutes. Again mix the contents, and centrifuge for about 5 minutes at 1500 or more revolutions per minute. Carefully decant the supernatant liquid, and allow the inverted tube to drain in a rack for 5 minutes, with the mouth of the tube resting on a pad of filter paper. While still inverted, dry the mouth of the tube with a soft cloth. Place the tube in an upright position. Stir the precipitate, and wash the sides of the tube with 3 cc. of ammonia solution (made by mixing 2 cc. of strong solution of ammonia with 98 cc. of distilled water) directed in a very fine stream from a wash bottle. Centrifuge the suspension, decant the supernatant liquid, drain for 5 minutes, and again dry the mouth of the tube. Add 2 cc. of approximately normal sulfuric acid, blowing it from a pipette directly upon the precipitate so as to break up the mat

and facilitate solution. Place the tube and contents in boiling water for about 1 minute and titrate with hundredth-normal potassium permanganate to a definite pink color which persists for at least 1 minute. During the course of the titration maintain the contents of the tube at a temperature of from 70° to 75° C. Add the permanganate solution from a micro-burette graduated in 0.02-cc. divisions and having a tip of sufficiently fine bore to permit the addition of as little as 0.01 cc. of solution at a time. If the duplicate determinations do not agree within 0.04 cc. of the permanganate solution, repeat the determination. Perform a blank titration, using 2 cc. of the same sulfuric acid used to dissolve the precipitate, and make appropriate correction. Each cc. of hundredth-normal potassium permanganate is equivalent to 0.20 mg. of calcium (Ca).

Storage—Preserve Parathyroid Injection in a cold place, preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Parathyroid Injection usually available contains the following equivalent of parathyroid: 100 U. S. P. Units in 1 cc.

AVERAGE DOSE OF PARATHYROID—Intramuscular, 25 U. S. P. Units.

INJECTIO PHENOLSULFONPHTHALEINI

Phenolsulfonphthalein Injection

Inj. Phenolsulfonphthal.—Phenolsulfonphthalein Ampuls

Phenolsulfonphthalein Injection is a sterile solution of phenolsulfonphthalein in isotonic solution of sodium chloride made with water for injection and rendered soluble with sodium bicarbonate or sodium hydroxide. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of phenolsulfonphthalein ($C_{18}H_{14}O_6S$), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

PHENOLSULFONPHTHALEIN.....	6	Gm.
SODIUM CHLORIDE.....	9	Gm.
SODIUM BICARBONATE.....	1.43	Gm.
WATER FOR INJECTION, a sufficient quantity,		
To make.....	1000	cc.

To the phenolsulfonphthalein contained in a beaker of about 500-cc. capacity, add 100 cc. of water for injection, then dissolve the sodium bicarbonate, added in small portions, and with stirring. Add the sodium chloride, and boil the mixture gently until the volume of the solution has been reduced to about 70 cc. Filter through a pledget of sterile cotton into a suitable flask, and wash the filter with water for injection. Dilute to about 950 cc. with water for injection, and test the solution for sensitiveness as directed below. If necessary, adjust

the solution so that it will conform to the test for sensitiveness by adding sufficient weak solution of sodium hydroxide. Then dilute with water for injection to 1000 cc., mix well, distribute in suitable containers, and sterilize preferably by Process C. See *Sterilization Processes*, page 614.

NOTE—The 1.43 Gm. of sodium bicarbonate may be replaced by 17 cc. of normal sodium hydroxide.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—To a volume of the Injection, equivalent to about 5 mg. of phenolsulfonphthalein, add 2 cc. of tenth-normal bromine and 1 cc. of diluted hydrochloric acid, shake well, allow to stand for 5 minutes, then make alkaline with sodium hydroxide T.S.: an intense blue violet color is produced.

Sensitiveness—Dilute a portion of the Injection with distilled water to a concentration of about 1 mg. of phenolsulfonphthalein in 1 cc. of the dilution. Add 0.2 cc. of this dilution to 50 cc. of recently boiled and cooled distilled water, then add 0.2 cc. of fiftieth-normal sodium hydroxide: a strong violet-tinted pink color is produced, which changes to pale yellow upon the addition of 0.2 cc. of fiftieth-normal sulfuric acid.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, equivalent to from 40 to 50 mg. of phenolsulfonphthalein, to an iodine flask. Add 10 cc. of distilled water, and follow with 15 cc. of tenth-normal bromine. Add 2 cc. of hydrochloric acid, immediately stopper the flask, and shake the contents gently for 5 minutes. Quickly pour into the flask 10 cc. of aqueous potassium iodide (1 in 10), and immediately close the flask. Shake gently for 1 minute, then rinse the stopper and the neck of the flask with a few cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. near the end of the titration. Perform a blank determination with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.004429 Gm. of $C_{19}H_{14}O_5S$.

Storage—Preserve Phenolsulfonphthalein Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Phenolsulfonphthalein Injection usually available contains the following amount of phenolsulfonphthalein: 6 mg. ($\frac{1}{10}$ grain) in 1 cc.

AVERAGE DOSE OF PHENOLSULFONPHTHALEIN—Diagnostic—

Intravenous or intramuscular, Metric, 6 mg.—Apothecaries, $\frac{1}{10}$ grain.

INJECTIO PICROTOXINI

Picrotoxin Injection

Inj. Picrotox.

Picrotoxin Injection is a sterile solution of picrotoxin in isotonic solution of sodium chloride. It contains in each cc. not less than 90 per cent and not more than 110 per cent of the labeled amount of picrotoxin ($C_{30}H_{34}O_{13}$), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Picrotoxin Injection preferably by Process F. See *Sterilization Processes*, page 614.

Alcohol or chlorobutanol may be added as a preservative and the name and amount of the preservative must be stated on the label. The Injection also conforms to the other requirements under *Injectiones*, page 219.

Identification—

A: The picrotoxin obtained in the *assay* melts between 197° and 200° C., and responds to *identification tests A, B, and C* under *Picrotoxinum*, page 363.

B: Picrotoxin Injection responds to the test for sodium, page 592, and for chloride, page 589.

Limit of sodium chloride—Transfer an accurately measured volume of the Injection, equivalent to about 0.1 Gm. of sodium chloride, to a 100-cc. volumetric flask, dilute with about 25 cc. of water, and slowly add, while agitating, exactly 25 cc. of tenth-normal silver nitrate. Add 5 cc. of nitric acid, dilute with distilled water to exactly 100 cc., and mix well. Filter through a dry filter into a dry flask, rejecting the first 10 cc. of the filtrate. To exactly 50 cc. of the subsequent filtrate add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.005845 Gm. of NaCl. Not less than 0.85 Gm. and not more than 0.95 Gm. of NaCl is present in 100 cc. of the Injection.

Assay—Transfer to a separator an accurately measured volume of the Injection obtained in the test for *Determination of the Volume of Injection in Containers*, page 220, equivalent to about 50 mg. of picrotoxin. If the Injection contains alcohol, evaporate at first sufficiently to expel the alcohol, then transfer completely to the separator. Add 1 cc. of diluted hydrochloric acid, and extract the picrotoxin completely by shaking with several successive portions of chloroform, until 2 cc. of the last chloroform extract leaves no weighable residue upon evaporation on a steam bath. Wash the combined chloroform extract with two 10-cc. portions of distilled water, slightly acidulated with hydrochloric acid, then extract the combined water washings with 10 cc. of chloroform, and add it to the main chloroform solution. Evaporate the combined chloroform extracts on a steam bath in a tared vessel, dry for 1 hour between 105° and 110° C., cool, and weigh. The weight so obtained represents the weight of the picrotoxin in the volume of the solution taken for the assay.

Storage—Preserve Picrotoxin Injection preferably in hermetic, single-dose containers, or in other suitable containers. See *Containers for Injections*, page 567. Protect the Injection from light.

Sizes—Picrotoxin Injection usually available contains the following amount of picrotoxin: 3 mg. ($\frac{1}{20}$ grain) in 1 cc.

AVERAGE DOSE OF PICROTOXIN—Intravenous, Metric, 2 mg.—

Apothecaries, $\frac{1}{30}$ grain, or more, depending upon the severity of the barbiturate poisoning.

INJECTIO PITUITARII POSTERIORIS

Posterior Pituitary Injection

Inj. Pituitar. Post.—Liquor Pituitarii Posterioris U. S. P. XI, Solution of Posterior Pituitary U. S. P. XI, Solution of Pituitary

Posterior Pituitary Injection is a sterile solution in water for injection

of the water-soluble principle or principles from the posterior lobe of the pituitary body of healthy domesticated animals used for food by man. The pituitary body must have been removed from the animal immediately after slaughtering and then dried or extracted at once or kept frozen until extracted. *The potency of Posterior Pituitary Injection shall be such that 0.1 cc. of the Injection shall possess an activity equivalent to one U. S. P. Posterior Pituitary Unit.** It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Posterior Pituitary Injection preferably by Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Description—Posterior Pituitary Injection is a clear or only faintly opalescent liquid, colorless, or nearly so, and having a faint, characteristic odor.

Assay—Prepare a standard solution as follows: Carefully weigh a suitable amount of U. S. P. Posterior Pituitary Reference Standard, place this weighed powder in a small agate or glass mortar, and moisten with a few drops of distilled water containing 0.25 per cent of acetic acid. Triturate the moistened powder thoroughly until the whole has an impalpable, frothy consistence. Add a few cc. of the 0.25 per cent acetic acid, and stir the mixture thoroughly. Transfer to an Erlenmeyer flask; rinse the mortar with the acetic acid solution, and add the rinsings to the pituitary mixture; then add enough 0.25 per cent acetic acid to make the final volume of the mixture contain the same number of cc. as the number of milligrams of U. S. P. Posterior Pituitary Reference Standard originally taken. Place a small, shortened funnel in the mouth of the flask, heat the mixture to the boiling point for not more than 1 minute, and filter. The filtrate contains in each cc. the active principle of 1 mg. of the reference standard. Place this standard solution in hard glass ampuls and sterilize by fractional sterilization for 20 minutes on each of three successive days at a temperature of flowing steam but not exceeding 100° C. Preserve in a cool place (from 5° to 20° C.). This standard solution should not be kept more than 6 months.

The apparatus used for making the test may be any modification of the general type for recording the activity of the isolated smooth muscle of mammals. It must be provided with an accurate temperature regulating device. The temperature of the bath should be between 37° and 38° C. but should not vary more than one-tenth of a degree throughout the assay. The chamber in which the uterus is suspended should have a capacity of not less than 100 cc.

Use healthy guinea pigs weighing between 175 Gm. and 350 Gm. They should not have been pregnant and should not be in heat. It is recommended that young female guinea pigs be segregated at the time of weaning and kept thereafter out of sight and smell of the males.

Kill a guinea pig by a blow on the head, or by decapitation, and immediately remove the entire uterus from the body. Suspend one horn of the uterus in a chamber containing oxygenated Locke-Ringer's solution (page 737), one end of the horn being attached to a muscle lever. The lever may be weighted if necessary, but the amount of weight attached to the lever must not be changed while the contractions constituting the assay are being obtained. When the uterus is completely relaxed, which is generally in from 15 to 30 minutes, the assay may be started. Dilute with isotonic solution of sodium chloride suitable quantities of the standard solution and of the preparation to be assayed. Determine the quantity of the

* The potency of 0.5 mg. of the U. S. P. Posterior Pituitary Reference Standard represents 1 U. S. P. Unit.

diluted standard solution and the quantity of the diluted preparation to be assayed which, when standard and unknown are administered alternately, will elicit a series of four contractions of approximately the same height. Then administer a third dose of the diluted standard solution 25 per cent larger than the two preceding doses of the diluted standard solution. Measure the height of each of the five contractions. The first four contractions are to be considered to be submaximal and equivalent, and to constitute an assay, if the difference in height between the highest and lowest of these four is less than half the difference in height between the lowest of the four and the contraction resulting from the increased dose of reference standard. From the quantities required to produce these equivalent contractions, calculate the strength, in U. S. P. Posterior Pituitary Units, of the preparation assayed.

NOTE—Owing to the many variable factors in the assay of Solution of Posterior Pituitary, evidence of potency in all assays to within 20 per cent above or below the standard is acceptable.

Storage—Preserve Posterior Pituitary Injection in well-filled containers and protect the Injection from light. A suitable preservative may be added to Posterior Pituitary Injection (see also page 219).

Sizes—Posterior Pituitary Injection usually available contains the following amounts of posterior pituitary: 0.5 cc. (5 U. S. P. Units); 1 cc. (10 U. S. P. Units).

AVERAGE DOSE OF POSTERIOR PITUITARY—Intramuscular,
Metric, 1 cc.—Apothecaries, 15 minims.

INJECTIO QUININÆ HYDROCHLORIDI ET ÆTHYLIS CARBAMATIS

Quinine Hydrochloride and Ethyl Carbamate Injection

Inj. Quin. Hydrochlor. et Aethyl. Carb.—Quinine Hydrochloride and Ethyl Carbamate Ampuls, Quinine-Urethane Injection

Quinine Hydrochloride and Ethyl Carbamate Injection is a sterile solution in water for injection of approximately two parts of quinine hydrochloride and one part of ethyl carbamate. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of quinine hydrochloride ($C_{20}H_{24}N_2O_2 \cdot HCl \cdot 2H_2O$) and of ethyl carbamate ($C_3H_7O_2N$). It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Quinine Hydrochloride and Ethyl Carbamate Injection preferably by Process F or Process E at a temperature not exceeding 65° C. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—

A: The residue obtained in the assay for quinine hydrochloride, when dissolved in diluted sulfuric acid, shows a vivid blue fluorescence, and the solution responds to identification test B under *Quininæ Hydrochloridum*, page 389.

B: The Injection responds to the test for chloride, page 589.

Assay for quinine hydrochloride—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, with distilled water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 0.5 Gm. of quinine hydrochloride, to a separator, render distinctly alkaline with ammonia T.S., and extract the alkaloid completely by shaking with successive portions of chloroform until 0.5 cc. of the aqueous layer, when slightly acidulated with hydrochloric acid, gives no reaction with mercuric potassium iodide T.S. Wash the combined chloroform extract with two 5-cc. portions of distilled water, filter the chloroform through a filter paper moistened with chloroform into a tared flask or beaker, and wash the filter with several small portions of chloroform. Evaporate the combined chloroform solutions nearly to dryness on a steam bath, dissolve the residue in 10 cc. of ether, evaporate to dryness on a steam bath, and dry to constant weight at 100° C. The weight of the anhydrous quinine so obtained, multiplied by 1.2236, represents the equivalent weight of quinine hydrochloride ($C_{20}H_{24}N_2O_2 \cdot HCl \cdot 2H_2O$).

Assay for ethyl carbamate—Transfer an accurately measured volume of the dilution prepared in the *assay for quinine hydrochloride*, equivalent to about 0.15 Gm. of ethyl carbamate, to a 500-cc. Kjeldahl flask, and dilute with distilled water to about 30 cc. Add carefully 20 cc. of sulfuric acid, and boil gently under a reflux condenser for 3 hours. Cool thoroughly, cautiously dilute with 150 cc. of distilled water, and again cool. Connect the flask with a trap condenser and with a receiver containing exactly 25 cc. of tenth-normal sulfuric acid. Make the contents of the flask strongly alkaline with sodium hydroxide (use about 100 cc. of 30 per cent solution), and distil until the distillate measures about 175 cc., then titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.008909 Gm. of ethyl carbamate ($C_3H_7O_2N$).

Storage—Preserve Quinine Hydrochloride and Ethyl Carbamate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Quinine Hydrochloride and Ethyl Carbamate Injection usually available contains the following amounts of quinine hydrochloride and of ethyl carbamate: Quinine Hydrochloride—0.25 Gm. (4 grains) and Ethyl Carbamate—0.12 Gm. (2 grains) in 2 cc.

INJECTIO STROPHANTHINI

Strophanthin Injection

Inj. Strophanthin.—Strophanthin Ampuls

Strophanthin Injection is a sterile solution of strophanthin in water for injection. Its potency shall be stated on the label of the container in terms of the quantity of U. S. P. Ouabain Reference Standard to which it is equivalent. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Strophanthin Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Assay—Proceed as directed under *Strophanthinum*, page 434.

Storage—Preserve Strophanthin Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

Protect the Injection from light.

Sizes—Strophanthin Injection usually available contains the following amount of strophanthin: 0.5 mg. ($\frac{1}{120}$ grain) in 1 cc.

AVERAGE DOSE OF STROPHANTHIN—Intravenous, Metric,
0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

INJECTIO SULFOBROMOPHTHALEINI SODICI

Sulfobromophthalein Sodium Injection

Inj. Sulfobromophthal. Sod.—Sulfobromophthalein Sodium Ampuls

Sulfobromophthalein Sodium Injection is a colorless, or almost colorless, sterile solution of sulfobromophthalein sodium in water for injection. It contains not less than 94 per cent and not more than 106 per cent of the labeled amount of sulfobromophthalein sodium ($C_{20}H_3Br_4O_{11}S_2Na$), including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Sulfobromophthalein Sodium Injection preferably by Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—

A: The Injection responds to *identification test A* under *Sulfobromophthaleinum Sodicum*, page 444.

B: To a volume of the Injection containing about 50 mg. of sulfobromophthalein sodium add 0.5 Gm. of sodium carbonate, evaporate to dryness, and ignite. The residue responds to *identification test B* under *Sulfobromophthaleinum Sodicum*, page 444.

Sensitiveness—Dilute the Injection with distilled water to a concentration of 1 mg. of sulfobromophthalein sodium in each cc. Add 0.2 cc. of this dilution to 50 cc. of recently boiled and cooled distilled water, then add 0.2 cc. of fiftieth-normal sodium hydroxide. The liquid acquires a strong violet color, and the color is discharged on the subsequent addition of 0.2 cc. of fiftieth-normal sulfuric acid.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, equivalent to about 0.15 Gm. of sulfobromophthalein sodium, to a tared dish, evaporate to dryness on a steam bath, and dry to constant weight at 100° C.: the weight of the residue represents the quantity of sulfobromophthalein sodium in the volume of the Injection taken for the assay.

Storage—Preserve Sulfobromophthalein Sodium Injection preferably in single-dose, hermetic containers or in other suitable containers. See *Containers for Injections*, page 567.

Sizes—Sulfobromophthalein Sodium Injection usually available contains the following amount of sulfobromophthalein sodium: 150 mg. ($2\frac{1}{2}$ grains) in 3 cc.

AVERAGE DOSE OF SULFOBROMOPHTHALEIN SODIUM—For each kilogram of body weight, intravenous, Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain.

INJECTIO THEOPHYLLINÆ ÆTHYLENEDIAMINICÆ

Theophylline Ethylenediamine Injection

Inj. Theophyll. Æthylenediam.—Theophylline Ethylenediamine Ampuls, Amino-phylline Ampuls

Theophylline Ethylenediamine Injection is a sterile solution of theophylline ethylenediamine in water for injection. It contains an amount of anhydrous theophylline ($C_7H_8N_4O_2$) equivalent to not less than 73 per cent and not more than 83 per cent of the labeled amount of theophylline ethylenediamine, including all tolerances. It meets the requirements of the *Sterility Test for Liquids*, page 609.

Sterilize Theophylline Ethylenediamine Injection preferably by Process C or Process F. See *Sterilization Processes*, page 614.

The Injection also conforms to the other requirements under *Injections*, page 219.

Identification—Dilute a volume of the Injection, equivalent to about 0.5 Gm. of theophylline, with distilled water to about 25 cc., and add, with constant stirring, 1 cc. of diluted hydrochloric acid or enough to precipitate the theophylline completely. Filter, wash the precipitate with a small portion of cold distilled water, and dry at about $100^{\circ}C$.: the theophylline so obtained melts between 270° and $274^{\circ}C$. and responds to the *identification tests A and B* under *Theophyllina*, page 497.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 220, with distilled water to an exact volume and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 0.3 Gm. of theophylline, to a 250-cc. Erlenmeyer flask, and add sufficient distilled water to make the volume measure about 25 cc. Add 8 cc. of ammonia T.S., then add exactly 20 cc. of tenth-normal silver nitrate, and allow to stand for 1 hour. Filter through a filtering crucible with the aid of a vacuum, and wash the precipitate three times with 10-cc. portions of distilled water. Neutralize the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01802 Gm. of anhydrous theophylline ($C_7H_8N_4O_2$).

Storage—Preserve Theophylline Ethylenediamine Injection preferably in single-

dose hermetic containers, or in other suitable containers. See *Containers for Injections*, page 567.

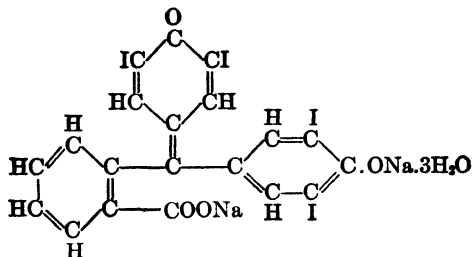
Sizes—Theophylline Ethylenediamine Injection usually available contains the following amounts of theophylline ethylenediamine: 0.25 Gm. (4 grains) in 10 cc.; 0.5 Gm. (7½ grains) in 2 cc.; 0.5 Gm. (7½ grains) in 20 cc.

AVERAGE DOSE OF THEOPHYLLINE ETHYLENEDIAMINE—Intramuscular or intravenous, Metric, 0.1 Gm.—Apothecaries, 1½ grains.

IODOPHTHALEINUM SODICUM

Iodophthalein Sodium

Iodophthal. Sod.—Iodophthaleinum Solubile U. S. P. XI, Soluble Iodophthalein U. S. P. XI, Tetraiodophenolphthalein Sodium, Tetraiodophthalein Sodium, Tetiodophthalein Sodium



Mol. wt. 919.99

Iodophthalein Sodium is the disodium salt of tetraiodophenolphthalein. It contains not less than 85 per cent of tetraiodophenolphthalein. The separated tetraiodophenolphthalein contains not less than 60 per cent and not more than 63 per cent of iodine (I).

Description—Iodophthalein Sodium is a pale blue violet, odorless, crystalline powder, having a saline and astringent taste. On exposure to air it absorbs carbon dioxide and gradually decomposes with the liberation of the free phthalein.

Solubility—One Gm. of Iodophthalein Sodium dissolves in about 7 cc. of water at 25° C.; it is slightly soluble in alcohol.

Identification—

A: To 10 cc. of an aqueous solution of Iodophthalein Sodium (1 in 50) add enough diluted hydrochloric acid, drop by drop, to make the mixture acid: a cream-colored precipitate is formed.

B: Iodophthalein Sodium darkens in color and evolves vapors of iodine when strongly heated.

Free phthalein—One Gm. of Iodophthalein Sodium dissolves completely in 50 cc. of recently boiled and cooled distilled water, producing a clear, deep blue solution. On standing in contact with air, this solution may absorb carbon dioxide and develop a precipitate of free iodophthalein.

Assay for tetraiodophenolphthalein—Weigh accurately about 0.5 Gm. of Iodophthalein Sodium in a stoppered weighing-bottle, and transfer it completely to a beaker with about 50 cc. of distilled water. When solution is complete, add, with stirring, 20 cc. of diluted hydrochloric acid, and allow to stand for 30 minutes.

Filter through a tared filtering crucible, prepared with a disk of filter paper. Wash the precipitate with 50 cc. of a mixture of equal volumes of diluted hydrochloric acid and hot distilled water, using small portions at a time. Remove the excess of liquid by the use of suction, and dry the precipitate of tetraiodophenolphthalein to constant weight at 110° C. The weight of the precipitate is not less than 85 per cent of the weight of the Iodophthalein Sodium taken for the assay.

Assay for iodine—Place about 0.2 Gm., accurately weighed, of the tetraiodophenolphthalein obtained in the assay described above, in a 500-cc. Erlenmeyer flask, and add 15 cc. of an aqueous solution of sodium hydroxide (1 in 20). Place the flask on a steam bath, and when the substance has dissolved completely, add 25 cc. of an aqueous solution of potassium permanganate (1 in 15). Rinse the inside of the flask with a small amount of distilled water, and heat the mixture on a steam bath for 45 minutes, rotating the contents of the flask at intervals of 5 minutes. Remove the flask from the steam bath, allow the contents to cool to room temperature, and add 75 cc. of distilled water, followed by 20 cc. of diluted sulfuric acid. Add, in one portion, 15 cc. of an aqueous solution of sodium bisulfite (1 in 5), and, when the solution has become colorless, add the solution of potassium permanganate, drop by drop, until a faint yellow color appears, then add at once solution of sodium bisulfite, drop by drop, just to discharge the color. Add 2 cc. of glacial acetic acid, 1 Gm. of freshly powdered ammonium carbonate, and 0.5 cc. of diiodofluorescein T.S. Titrate the solution in a diffuse light with tenth-normal silver nitrate until the color just changes from brownish red to bluish red. Each cc. of tenth-normal silver nitrate is equivalent to 0.01269 Gm. of iodine (I).

Storage—Preserve Iodophthalein Sodium in tight containers.

AVERAGE DOSE—For each 10 kilograms of body weight—

	Metric	Apothecaries
Oral,	0.5 Gm.	—7½ grains.
Intravenous,	0.3 Gm.	—5 grains.

IODUM

Iodine

Iod.

I

At. wt. 126.92

Iodine contains not less than 99.8 per cent of I.

Description—Iodine occurs in the form of heavy, grayish black plates or granules, having a metallic luster and a characteristic odor.

Solubility—One Gm. of Iodine is soluble in about 2950 cc. of water, in 13 cc. of alcohol, in about 80 cc. of glycerin, and in about 4 cc. of carbon disulfide. It is freely soluble in chloroform, in carbon tetrachloride, and in ether, and is dissolved by aqueous solutions of iodides.

Identification—

- A: Solutions of Iodine in alcohol and in aqueous solutions of iodides have a reddish brown color.
- B: Solutions of Iodine (1 in 1000) in chloroform, in carbon tetrachloride, or in carbon disulfide have a violet color.
- C: Add starch T.S. to a saturated, aqueous solution of Iodine: a blue color is produced. When the mixture is boiled, the color vanishes but reappears as it cools, unless it has been subjected to long continued boiling.

Non-volatile residue—When volatilized, Iodine leaves not more than 0.05 per cent of residue.

Chloride or bromide—Triturate 0.5 Gm. of finely powdered Iodine with 20 cc. of distilled water, and filter the solution. To one-half of the filtrate add, drop by drop, sulfurous acid (free from chloride), previously diluted with several volumes of distilled water, until the iodine color just disappears. Add 5 cc. of ammonia T.S., and follow with 5 cc. of silver nitrate T.S. in small portions. Filter, and acidulate the filtrate with nitric acid: the resulting liquid is not more turbid than a control made with the same quantities of reagents to which 0.1 cc. of fiftieth-normal hydrochloric acid has been added, omitting the sulfurous acid.

Assay—Place about 0.5 Gm. of powdered Iodine in a tared weighing bottle, stopper, weigh accurately, and add 1 Gm. of potassium iodide, dissolved in 5 cc. of distilled water. Dilute this solution with distilled water to about 50 cc., add 1 cc. of diluted hydrochloric acid, and titrate with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.01269 Gm. of I.

Storage—Preserve Iodine in tight containers.

U. S. P. Products of Iodine—Liquor Iodi, Liquor Iodi Fortis, Tinctura Iodi, Tinctura Iodi Mitis, Unguentum Iodi.

IPECACUANHA

Ipecac

Ipecac.—*Ipecacuanhæ radix* P.I.

Ipecac consists of the dried rhizome and roots of *Cephaëlis Ipecacuanha* (Brotero) A. Richard, known in commerce as Rio or Brazilian Ipecac, or of *Cephaëlis acuminata* Karsten, known in commerce as Cartagena, Nicaragua, or Panama Ipecac (Fam. *Rubiaceæ*).

Ipecac yields not less than 2 per cent of the ether-soluble alkaloids of Ipecac. It contains not more than 5 per cent of its overground stems and not more than 2 per cent of other foreign matter, page 628.

Description—

Unground Rio Ipecac—Roots in cylindrical pieces, mostly curved and sharply flexuous, occasionally branched, from 3 to 15 cm. in length, from 1 to 4 mm. in diameter, reddish brown to dark brown, either smooth or closely annulated, with thickened, incomplete rings and usually exhibiting transverse fissures with vertical sides; bark of smooth root thin, approximately one-ninth of the diameter of the root, that of the annulated root approximately two-thirds of the entire diameter; fracture of bark short, easily separable from the tough, fibrous wood; odor distinctive, the dust sternutatory; taste bitter, nauseous, and acrid. Rhizomes cylindrical, attaining a length of 10 cm. and a thickness of 2 mm., finely longitudinally wrinkled, with a few elliptical scars and a distinct pith approximately one-sixth of the entire diameter of the rhizome.

Histology of Rio Ipecac—Outer layer brown to yellowish orange, consisting of several layers of cork cells, some showing distinct granular masses covering the tangential walls; cortex consisting chiefly of parenchyma cells filled with starch grains, a few containing raphides of calcium oxalate; wood, yellowish, consisting of characteristic tracheæ and tracheids with bordered or slit-like pores, modified medullary rays of prosenchymatous cells containing starch grains, the latter up to 15 microns in diameter, and a few lignified fibers with oblique slit-like pores and more or less attenuated ends; rhizome differing from the root mainly by exhibiting a central pith and a narrower wood.

Unground Cartagena Ipecac—As compared with Rio Ipecac, up to 6.5 mm. in diameter; externally grayish, grayish brown or reddish brown, the reddish

brown variety frequently beset with numerous transverse ridges bearing light-colored abrasions; annulations less numerous; simple starch grains, on the average, larger in the medullary rays of the wood.

Powdered Ipecac—Pale brown, weak yellow or light olive gray. Elements of identification: the cork cells; the starch grains simple or 2- to 8-compound, the simple grains up to 15 microns in diameter (Rio Ipecac) and up to 20 microns in diameter (Cartagena Ipecac); raphides of calcium oxalate up to 56 microns in length and fragments of the porous tracheids and tracheæ.

Assay—Place 10 Gm. of Ipecac, in fine powder, in a dry, 250-cc. flask. Add 100 cc. of peroxide-free ether, measured at 25° C., stopper the flask tightly, shake the mixture thoroughly, and allow it to stand for 5 minutes. Then add 10 cc. of ammonia T.S., stopper the flask tightly, shake it for 1 hour in a mechanical shaker, or intermittently during 2 hours and allow to stand over night at a temperature not exceeding 25° C. Again shake the mixture intermittently during 30 minutes, then allow the drug to settle at 25° C. Then quickly transfer to a separator exactly 50 cc. of the clear, supernatant liquid, representing 5 Gm. of Ipecac, rinse the measuring vessel with a small volume of ether, and add the rinsing to the solution in the separator.

Completely extract the alkaloids from the ether solution with approximately normal sulfuric acid, preferably using 15 cc. the first time, or sufficient to insure an acid reaction, and 10 cc. for each succeeding extraction, and filtering all extractions through the same filter into a second separator (see *Purification of the Alkaloids*, page 604). To the combined acid solutions add about an equal volume of peroxide-free ether, render the mixture alkaline with ammonia T.S., and completely extract with successive portions of peroxide-free ether. Filter each portion of the ether extract into a 200-cc. flask or beaker, and carefully evaporate the combined ether solutions on a steam bath until nearly but not quite dry. Add 5 cc. of the peroxide-free ether and exactly 10 cc. of tenth-normal sulfuric acid, and heat on a steam bath to effect complete solution of the alkaloid and to remove all of the ether. Cool, dilute with 15 cc. of distilled water, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.0240 Gm. of the ether-soluble alkaloids of ipecac.

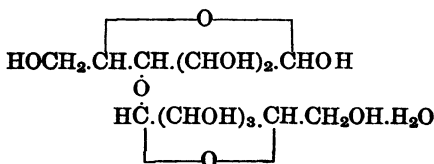
U. S. P. Products of Ipecac—Fluidextractum Ipecacuanhæ, Syrupus Ipecacuanhæ.

AVERAGE DOSE—Emetic, Metric, 0.5 Gm.—Apothecaries, 7½ grains.

LACTOSUM

Lactose

Lactos.—Saccharum Lactis, Milk Sugar



¹C₁₂H₂₂O₁₁·H₂O

Mol. wt. 360.31

Lactose is a sugar obtained from milk.

Description—Lactose occurs as white, hard, crystalline masses or as a white powder. It is odorless, and has a faintly sweet taste. It is stable in air, but readily absorbs odors.

Solubility—One Gm. of Lactose dissolves in 5 cc. of water at 25° C., and in 2.6 cc. of

boiling water. Lactose is very slightly soluble in alcohol and is insoluble in chloroform and in ether.

Optical rotation—The specific rotation $[\alpha]_D^{20}$ of Lactose is not less than $+52.2^\circ$ and not more than $+52.5^\circ$ when determined in an aqueous solution, each 100 cc. containing 10 Gm. of Lactose, previously dried to constant weight at 80°C. , and 0.2 cc. of ammonia T.S., and using a 200-mm. tube, page 601.

Identification—Add 5 cc. of sodium hydroxide T.S. to 5 cc. of a hot, saturated, aqueous solution of Lactose, and gently warm the mixture: the liquid becomes yellow and finally brownish red. On the subsequent addition of a few drops of cupric sulfate T.S., a red precipitate of cuprous oxide forms.

Ash—Lactose yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Lactose (1 in 20) is neutral to litmus paper.

Heavy metals—Dissolve 3 Gm. of Lactose in 20 cc. of warm distilled water, add 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with distilled water. The heavy metals limit, page 586, for Lactose is 5 parts per million.

Dextrose—Add 25 cc. of 70 per cent alcohol (by volume) to 5 Gm. of Lactose, reduced to at least a No. 100 powder. Shake the mixture frequently during 30 minutes, and filter through a dry filter having a diameter of from 5 to 7 cm. Evaporate 5 cc. of the filtrate to dryness on a water bath, and dissolve the residue in 5 cc. of distilled water. Transfer the solution to a test tube, filtering if necessary, and add 5 cc. of stronger cupric acetate T.S. Immerse the test tube in boiling water or in actively flowing steam for 3 minutes, and allow to stand at room temperature for 25 minutes: no red precipitate appears in the mixture.

Sucrose—Evaporate to dryness on a water bath a 10-cc. portion of the alcoholic solution prepared for the preceding test, dissolve the residue in 9 cc. of distilled water, and add 1 cc. of 25 per cent hydrochloric acid (made by mixing 20 cc. of hydrochloric acid with 8 cc. of distilled water) and 0.1 Gm. of resorcinol. Transfer the mixture to a thin-walled test tube of from 16- to 19-mm. internal diameter, and immerse the test tube in boiling water or actively flowing steam for 8 minutes: the liquid remains colorless or assumes only a slight, yellow color.

Starch or dextrin—Dissolve 1 Gm. of Lactose in 10 cc. of distilled water, boil for 1 minute, cool to room temperature, and add 1 drop of iodine solution (made by diluting 1 volume of iodine T.S. with 4 volumes of water): the mixture assumes no red, violet, or blue color.

Water-insoluble substances—A solution of 3 Gm. of Lactose in 10 cc. of boiling distilled water is clear, colorless, and odorless.

Storage—Preserve Lactose in well-closed containers.

LIGAMENTUM CARBASI ABSORBENS

Gauze Bandage

Lig. Carbas. Absorb.—Roller Gauze Bandage

Description—Gauze Bandage is prepared from Type I Absorbent Gauze in various widths and lengths. Each bandage is in one continuous piece, tightly rolled, and substantially free from loose threads and ravelings. Gauze Bandage must be sterile and protected from contamination.

Before determining the thread count, dimensions, and weight, all Gauze Bandage shall be unrolled and conditioned for at least 4 hours in a standard atmosphere of 65 per cent ± 2 per cent relative humidity, at $21^\circ \text{C.} \pm 1.1^\circ \text{C.}$ ($70^\circ \text{F.} \pm 2^\circ \text{F.}$).

Thread Count—Count the number of warp and filling threads in areas of 1.27 cm. ($\frac{1}{2}$ inch) square at 5 points evenly spread along the center line of the bandage, no point being within 30.5 cm. (12 inches) of either end of the bandage, and calculate the number of threads per 2.54 cm. (1 inch) in each direction. A variation of not more than 3 threads per inch is allowed in warp and filling, provided that the combined variations do not exceed 5 threads per square inch.

Width—Measure the width of the Gauze Bandage at each of the 5 points selected

for the determination of the thread count: the average of 5 measurements is not more than 1.6 mm. ($\frac{1}{16}$ inch) less than the labeled width of the bandage.

Length—Measure the length of the unrolled Gauze Bandage, smoothed without tension, along the center line of the Gauze Bandage: the actual length is not less than 98 per cent of the labeled length of the bandage.

Weight—Weigh the entire bandage: the calculated weight in Gm. per 0.894 square meter (1 linear yard *Type I gauze*), using the measurements obtained as described in the two paragraphs just preceding, is not less than 41.2 Gm.

Absorbency—Hold a rolled Gauze Bandage horizontal to and almost in contact with the surface of distilled water at 25° C., and allow it to drop lightly upon the water: it requires not more than 30 seconds for complete submersion.

Other requirements—Gauze Bandage meets the requirements of the tests for *ash, water, extract, water extract ash, acid or alkali, dextrin or starch, dyes, and fatty matter* under *Carbasus Absorbens*, page 114.

Sterility—Gauze Bandage meets the requirements of the *Sterility Tests for Solids*, page 610.

Storage—Each Gauze Bandage shall be so packaged individually that the sterility of the product is maintained until the package is opened for use. Gauze Bandage shall be sterilized in the package, and the package shall bear a statement to the effect that the sterility of the Bandage cannot be guaranteed if the package bears evidence of damage, or if the package has been previously opened. The width and length of the bandage shall be stated on the package.

LIMONIS CORTEX

Lemon Peel

Limon. Cort.

Lemon Peel is the outer yellow rind of the fresh ripe fruit of *Citrus Medica* Linné var. *Limon* Linné (Fam. *Rutaceæ*).

Description—The outer lemon yellow or dark yellow layer, separated from the fresh fruit by grating or paring; consisting of the epidermis and numerous parenchyma cells, some containing yellow chromoplastids and a few membrane crystals of calcium oxalate; large oil reservoirs with globules of the volatile oil; odor fragrant, distinctive; taste aromatic.

U. S. P. Products of Lemon Peel—Oleum Limonis, Syrupus Acidi Citrici, Tinctura Limonis.

LINIMENTUM CAMPHORÆ

Camphor Liniment

Lin. Camph.—Camphorated Oil

Camphor Liniment contains not less than 19 per cent and not more than 21 per cent of camphor.

Caution—This preparation is not intended for hypodermic use.

CAMPHOR, in coarse powder.....	200 Gm.
COTTONSEED OIL.....	800 Gm.
To make	1000 Gm.

Pour the cottonseed oil into a suitable dry flask or bottle, heat it on a water bath, add the camphor, and stopper the container securely.

Dissolve the camphor by agitation without the further application of heat.

Assay—Place approximately 5 cc. of Camphor Liniment in a dried and tared 120-cc. Erlenmeyer flask, and weigh accurately. Connect the flask with a U-shaped drying tube, place the flask and tube in an air oven maintained at 110° C., and pass a steady stream of carbon dioxide through the U-tube into the flask for 2 hours. The orifice of the gas delivery tube should be about 15 mm. above the surface of the Liniment. Remove the flask from the oven, blow out the remaining carbon dioxide with dry air, cool the flask in a desiccator, and weigh. The loss in weight is not less than 19 per cent and not more than 21 per cent of the weight of Camphor Liniment taken for the assay.

Storage—Preserve Camphor Liniment in tight containers.

LINIMENTUM CAMPHORÆ ET SAPONIS

Camphor and Soap Liniment

Lin. Camph. et Sapon.—Soap Liniment

HARD SOAP, dried and granulated, or powdered.....	60 Gm.
CAMPBOR, in small pieces.....	45 Gm.
OIL OF ROSEMARY.....	10 cc.
ALCOHOL.....	700 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the camphor and the oil of rosemary in the alcohol, add the soap, and then sufficient distilled water to make the product measure 1000 cc. Agitate the mixture until the soap is dissolved, set it aside in a cool place for 24 hours, and filter.

Alcohol content—From 62 to 66 per cent, by volume, of C_2H_5OH .

Storage—Preserve Camphor and Soap Liniment in well-closed containers.

U. S. P. Product of Camphor and Soap Liniment—Linimentum Chloroformi.

LINIMENTUM CHLOROFORMI

Chloroform Liniment

Lin. Chlorof.

Chloroform Liniment contains, at 25° C., in each 100 cc., not less than 27 cc. and not more than 30.5 cc. of $CHCl_3$.

CHLOROFORM.....	300 cc.
CAMPBOR AND SOAP LINIMENT.....	700 cc.
To make.....	1000 cc.

Mix them by agitation.

Assay—Determine the chloroform in 20 cc. of Chloroform Liniment, accurately measured at 25° C., as directed under *Chloroform Determination*, page 564. The volume of chloroform obtained, multiplied by 5, represents the volume of chloroform in 100 cc. of Chloroform Liniment.

Alcohol content—From 43 to 47 per cent, by volume, of C_2H_5OH .

Storage—Preserve Chloroform Liniment in tight containers, preferably at a temperature not above 30° C.

LINIMENTUM SAPONIS MOLLIS

Liniment of Soft Soap

Lin. Sapon. Moll.—Tincture of Green Soap

MEDICINAL SOFT SOAP.....	650 Gm.
OIL OF LAVENDER.....	20 cc.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Mix the oil of lavender with 300 cc. of alcohol, dissolve in this the medicinal soft soap by stirring or by agitation, and set the solution aside for 24 hours. Then filter it through paper, adding sufficient alcohol to make the product measure 1000 cc.

Alcohol content—From 28 to 32 per cent, by volume, of C_2H_5OH .

LINUM

Linseed

Flaxseed

Linseed is the dried ripe seed of *Linum usitatissimum* Linné (Fam. *Linaceæ*).

Linseed yields not less than 30 per cent of non-volatile, ether-soluble extractive, of which not more than 2 per cent is unsaponifiable matter. It contains not more than 2 per cent of other seeds or foreign organic matter, page 628.

Description—

Unground Linseed—Ovoid or oblong-lanceolate, flattened, obliquely pointed at one end, from 4 to 6 mm. in length; externally brown to dusky red; smooth and shiny; raphe a distinct, lighter-colored ridge along one edge; the hilum and micropyle in a slight depression just below the pointed end; internally light yellowish brown to weak yellow, oily; odor slight; taste mucilaginous, oily, and distinctive.

Histology—Spermoderm consisting of an epidermis with a mucilaginous outer wall covered by a very thin, more or less broken sheath of cutin; two layers of parenchyma overlying a continuous layer of stone cells; a hyaline layer of narrow, elongated, colorless cells and a pigment layer, with its cells having red to orange

contents; endosperm of from 6 to 10 rows of cells, surrounding two large, planoconvex cotyledons, the cells of cotyledons and endosperm containing fixed oil and aleurone grains.

Powdered Linseed—Yellowish brown; consisting chiefly of large oil globules and irregular fragments of endosperm, embryo, and seed-coat; seed-coat characterized by tabular pigment cells filled with reddish brown to yellowish brown, amorphous contents and by the somewhat radially elongated stone cells with orange to yellowish brown, porous walls and rather large lumina, and elongated, colorless cross cells; aleurone grains from 3 to 20 microns in diameter.

Linseed meal—Light yellowish brown to weak yellow with numerous dark-colored fragments of seed-coat; the fragments of both seed-coat and kernel mostly very coarse and with the same cellular tissues as those of the powder.

Starch or starch-bearing seeds—Boil 50 cc. of distilled water with 1 Gm. of fat-free Linseed powder or meal, filter the cooled mixture, and add iodine T.S. to the filtrate: not more than a faint blue color develops in the mixture.

Assay—Proceed as directed for the determination of *Non-volatile, Ether-soluble Extractive*, page 631, using 10 Gm. of ground or powdered Linseed. The non-volatile, ether-soluble extractive weighs not less than 3 Gm. Determine the unsaponifiable matter in 5 Gm. of this anhydrous extractive as directed on page 580: not more than 2 per cent of unsaponifiable matter remains.

U. S. P. Product of Linseed—Oleum Lini.

LIQUOR ACIDI ARSENIOSI

Solution of Arsenious Acid

Liq. Acid. Arsen.—Liquor Acidi Arsenosi U. S. P. XI, Hydrochloric Solution of Arsenic, Solution of Arsenic Chloride

Solution of Arsenious Acid contains, in each 100 cc., the equivalent of not less than 0.975 Gm. and not more than 1.025 Gm. of As_2O_3 .

ARSENIC TRIOXIDE.....	10 Gm.
DILUTED HYDROCHLORIC ACID.....	50 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the diluted hydrochloric acid with 250 cc. of distilled water in a flask, add the arsenic trioxide, and boil the liquid until the arsenic trioxide is completely dissolved. Allow the solution to cool, transfer it to a 1000-cc. graduated flask or cylinder, rinse the vessel in which the solution was boiled with several portions of distilled water, and add the rinsings and enough distilled water to make the product measure 1000 cc. Filter if necessary.

Description—Solution of Arsenious Acid is a clear, colorless liquid, without odor.

Identification—Hydrogen sulfide T.S. added to Solution of Arsenious Acid produces a yellow precipitate of arsenic trisulfide, which is completely soluble in ammonium carbonate T.S.

Reaction—Solution of Arsenious Acid is acid to litmus paper.

Assay—Measure accurately 20 cc. of Solution of Arsenious Acid, and dilute with 50 cc. of distilled water. Dissolve enough sodium bicarbonate in this solution to make

it distinctly alkaline (usually about 2 Gm.), and titrate with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.004946 Gm. of As_2O_3 .

Storage—Preserve Solution of Arsenious Acid in tight containers.

AVERAGE DOSE—Metric, 0.2 cc.—Apothecaries, 3 minims.

LIQUOR AMARANTHI

Solution of Amaranth

Liq. Amaranth.

AMARANTH.....	1 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	100 cc.

Dissolve the amaranth in sufficient distilled water to make the finished product measure 100 cc.

Description—Solution of Amaranth is a clear, vivid red liquid, with but a slight odor.

Residue—Evaporate 10 cc. of Solution of Amaranth on a water bath, and dry to constant weight at 100° C.: the weight of the residue is not less than 90 mg. and not more than 110 mg. The residue complies with the requirements for *Amaranthum*, page 50.

Storage—Preserve Solution of Amaranth in tight, light-resistant containers.

LIQUOR AMMONIÆ DILUTUS

Diluted Solution of Ammonia

Liq. Ammon. Dil.—Aqua Ammoniæ U. S. P. XI, Ammonia Water U. S. P. XI, Solution of Ammonium Hydroxide

Diluted Solution of Ammonia is an aqueous solution of ammonia (NH_3) containing, in each 100 cc., not less than 9 Gm. and not more than 10 Gm. of NH_3 . This solution deteriorates rapidly in open containers.

Diluted Solution of Ammonia may be prepared as follows:

STRONG SOLUTION OF AMMONIA.....	398 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the ingredients.

Description—Diluted Solution of Ammonia is a colorless, transparent liquid, having a very pungent, characteristic odor.

Specific gravity—The specific gravity of Diluted Solution of Ammonia is about 0.957 at 25° C.

Identification—Dense, white fumes are produced if a glass rod wet with hydrochloric acid is held near the surface of Diluted Solution of Ammonia.

Reaction—Diluted Solution of Ammonia is strongly alkaline to litmus paper.

Non-volatile substances—A 10-cc. portion of Diluted Solution of Ammonia, evaporated to dryness in a platinum or porcelain dish and dried to constant weight at 120° C., leaves not more than 2 mg. of residue.

Heavy metals—Evaporate 5 cc. of Diluted Solution of Ammonia to dryness on a water bath, add to the residue 1 cc. of diluted hydrochloric acid, and evaporate to dryness. Add to the residue 2 cc. of diluted acetic acid and 23 cc. of distilled water. The heavy metals limit, page 586, for Diluted Solution of Ammonia is 5 parts per million.

Oxidizable substances—To 10 cc. of Diluted Solution of Ammonia add a slight excess of diluted sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate: the pink color does not completely disappear in 10 minutes.

Assay—Transfer 5 cc. of Diluted Solution of Ammonia, accurately measured, to a suitable flask containing about 25 cc. of distilled water. Then titrate with normal sulfuric acid, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.01703 Gm. of NH_3 .

Storage—Preserve Diluted Solution of Ammonia in tight containers, preferably at a temperature not above 30° C.

U. S. P. Product of Diluted Solution of Ammonia—*Spiritus Ammoniaë Aromaticus*.

LIQUOR AMMONIÆ FORTIS

Strong Solution of Ammonia

Liq. Ammon. Fort.—*Aqua Ammoniaë Fortior* U. S. P. XI, Stronger Ammonia Water U. S. P. XI

Strong Solution of Ammonia is an aqueous solution of ammonia (NH_3), containing not less than 27 per cent and not more than 29 per cent of NH_3 . This solution deteriorates rapidly in open containers.

Caution—Great care should be used in handling Strong Solution of Ammonia because of the caustic and irritating properties of its vapor. Before the container is opened it should be well cooled and the closure covered with a towel before removal.

Description—Strong Solution of Ammonia is a colorless, transparent liquid, having an exceedingly pungent, characteristic odor, and a very caustic and alkaline taste.

Caution—Strong Solution of Ammonia must never be tasted nor its vapor inhaled.

Specific gravity—The specific gravity of Strong Solution of Ammonia is about 0.897 at 25° C.

Reaction—Strong Solution of Ammonia is strongly alkaline to litmus paper.

Other tests—Strong Solution of Ammonia, diluted with twice its volume of distilled water, conforms to the tests for *non-volatile substances, heavy metals, and oxidizable substances* under *Liquor Ammoniaë Dilutus*, page 259.

Assay—Accurately weigh a glass-stoppered flask containing about 25 cc. of distilled water, add about 2 cc. of Strong Solution of Ammonia, stopper, and weigh again. Titrate with normal sulfuric acid, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.01703 Gm. of NH_3 .

Storage—Preserve Strong Solution of Ammonia in tight containers, preferably at a temperature which does not exceed 25° C.

U. S. P. Product of Strong Solution of Ammonia—*Liquor Ammoniaë Dilutus*.

LIQUOR CALCII HYDROXIDI

Solution of Calcium Hydroxide

Liq. Calc. Hydrox.—Liquor Calcis, Lime Water

Solution of Calcium Hydroxide is an aqueous solution containing, in each 100 cc., at 25° C., not less than 0.14 Gm. of $\text{Ca}(\text{OH})_2$. The content of calcium hydroxide varies with the temperature at which the solution is stored, being about 0.17 Gm. per 100 cc. at 15° C., and less at a higher temperature.

Solution of Calcium Hydroxide may be prepared as follows:

CALCIUM HYDROXIDE..... 3 Gm.

DISTILLED WATER, a sufficient quantity

Add the calcium hydroxide to 1000 cc. of cool distilled water, and agitate the mixture vigorously and repeatedly during 1 hour. Allow the excess of calcium hydroxide to settle. Decant and dispense only the clear, supernatant liquid.

The undissolved portion of the mixture is not suitable for preparing additional quantities of Solution of Calcium Hydroxide.

Description—Solution of Calcium Hydroxide is a clear, colorless liquid with an alkaline taste.

Identification—

A: Solution of Calcium Hydroxide absorbs carbon dioxide from the air, a film of calcium carbonate forming on the surface of the liquid.

B: When heated, it becomes turbid, owing to the separation of calcium hydroxide.

Reaction—Solution of Calcium Hydroxide is strongly alkaline to litmus paper.

Alkalies and their carbonates—A portion of Solution of Calcium Hydroxide, saturated with carbon dioxide and subsequently boiled, is no longer alkaline in reaction.

Assay—Measure accurately 50 cc. of Solution of Calcium Hydroxide at 25° C., and titrate with tenth-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal hydrochloric acid is equivalent to 0.003705 Gm. of $\text{Ca}(\text{OH})_2$.

Storage—Preserve Solution of Calcium Hydroxide in well-filled, tight containers.

AVERAGE DOSE—Metric, 15 cc.—Apothecaries, 4 fluidrachms.

LIQUOR CHLORIDORUM TRIUM ISOTONICUS

Isotonic Solution of Three Chlorides

Liq. Chloridor. Tri. Isoton.—Ringer's Solution

Isotonic Solution of Three Chlorides contains, in each 100 cc., not less than 0.84 Gm. and not more than 0.88 Gm. of NaCl, not less than 25 mg. and not more than 35 mg. of KCl, and not less than 30 mg. and not more than 36 mg. of $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$.

Unless otherwise specified, No. 3—Sterile Isotonic Solution of Three Chlorides for Parenteral Use must be dispensed.

No. 1—Non-sterile Isotonic Solution of Three Chlorides

SODIUM CHLORIDE.....	8.6 Gm.
POTASSIUM CHLORIDE.....	0.30 Gm.
CALCIUM CHLORIDE.....	0.33 Gm.
DISTILLED WATER, recently boiled, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the three salts in a convenient quantity of recently boiled, recently distilled water to make 1000 cc., and filter, returning the filtrate until free from suspended particles.

No. 2—Sterile Isotonic Solution of Three Chlorides Not for Parenteral Use

Prepare the Solution as directed under No. 1 and sterilize preferably by Process C. See *Sterilization Processes*, page 614. The Solution meets the *Sterility Test for Liquids*, page 609.

No. 3—Sterile Isotonic Solution of Three Chlorides for Parenteral Use

Prepare the Solution as directed under No. 1 replacing the distilled water by water for injection. Place the Solution in suitable containers and sterilize preferably by Process C. See *Sterilization Processes*, page 614. The Solution meets the *Sterility Test for Liquids*, page 609, and the *Pyrogen Test*, page 606. It also conforms to the other requirements given under *Injections*, page 219. Bacteriostatic agents must not be added.

Description—Isotonic Solution of Three Chlorides is clear and colorless, and has a mild, saline taste.

Hydrogen-ion concentration—The pH of Isotonic Solution of Three Chlorides is from 5 to 7.5.

Heavy metals—To 20 cc. of Isotonic Solution of Three Chlorides add 2 cc. of diluted acetic acid, and dilute with distilled water to 25 cc.; the heavy metals limit (page 586) for Isotonic Solution of Three Chlorides is 0.3 part per million.

Arsenic—A 20-cc. portion of Isotonic Solution of Three Chlorides meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfuric and sulfurous acids.

Assay for calcium chloride—Evaporate 100 cc. of Isotonic Solution of Three Chlorides, accurately measured, to 20 cc., heat to boiling, and make alkaline with ammonia T.S. Add ammonium oxalate T.S., dropwise, until all of the calcium has been precipitated, heat on a water bath for 2 hours, filter through hardened filter paper, and wash thoroughly with warm distilled water. Puncture the filter, and wash the precipitate into a beaker by means of a stream of hot distilled water, followed by 30 cc. of diluted sulfuric acid. Heat to 80° C., and titrate with hundredth-normal potassium permanganate. Deduct from the volume of potassium permanganate consumed the volume of the same potassium permanganate required to produce the same end-point in the same volumes of distilled water and

diluted sulfuric acid as used to make the precipitate. Each cc. of hundredth-normal potassium permanganate is equivalent to 0.000735 Gm. of $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$.

Assay for potassium chloride—To 1.5 cc. of alcohol in a 15-cc. centrifuge tube add 5 cc. of Isotonic Solution of Three Chlorides, accurately measured, and mix thoroughly. Add dropwise, with continuous shaking, 2 cc. of sodium cobaltinitrite T.S. Allow to stand for 1 hour at room temperature. Centrifuge for 10 minutes at about 2000 r.p.m. or until the precipitate is firmly packed in the bottom of the tube. Decant the supernatant liquid and allow the precipitate to drain for 5 minutes. Wash the precipitate carefully with 5 cc. of 70 per cent alcohol, breaking the bulk of the precipitate by forcing the wash solution in a fine stream from the pipette. Centrifuge for 5 minutes and drain again. Dry the precipitate for 1 hour at 80° to 85° C. to remove all of the alcohol. Add 10 cc. of fiftieth-normal ceric sulfate and 1 cc. of sulfuric acid, which has been previously diluted with an equal volume of distilled water, and heat on a water bath until all of the precipitate has disappeared. Cool to room temperature, and titrate the excess of ceric sulfate with ferrous ammonium sulfate T.S., using 1 drop of orthophenanthroline T.S. as the indicator. Each cc. of fiftieth-normal ceric sulfate is equivalent to 0.0010 Gm. of KCl.

Assay for total chlorides—Proceed as directed for the Assay under *Liquor Sodii Chloridi Isotonicus*, page 275. Each cubic centimeter of tenth-normal silver nitrate is equivalent to 0.003546 Gm. of Cl. The chloride (Cl) content of 100 cc. of the Solution is not less than 0.52 Gm. and not more than 0.58 Gm.

Storage—Preserve Sterile Solutions in hermetic or other suitable containers. See *Containers for Injections*, page 567.

LIQUOR CHLOROAZODINI

Solution of Chloroazodin

Liq. Chloroazodin.

Solution of Chloroazodin contains, in each 100 cc., not less than 0.24 Gm. and not more than 0.28 Gm. of $\text{C}_2\text{H}_4\text{Cl}_2\text{N}_6$.

Caution—Solution of Chloroazodin should not come in contact with metal.

CHLOROAZODIN.....	2.6 Gm.
GLYCERYL TRIACETATE, a sufficient quantity,	
To make.....	1000 cc.

Place the glyceryl triacetate in a carefully dried vessel of glass or other vitreous material which can be tightly closed and in which the solution can be stirred with a minimum of exposure to air. Add the chloroazodin, and stir until dissolved, avoiding all unnecessary exposure to the air and to light. Close the vessel tightly, and set aside for at least 30 days, avoiding exposure to light. Filter with the aid of suction through filter paper on a glass or stoneware filter, and package immediately in tight containers.

Description—Solution of Chloroazodin is a clear, yellow, somewhat oily liquid, having a slight fatty odor and a bitter taste.

Specific gravity—The specific gravity of Solution of Chloroazodin is not less than 1.154 and not more than 1.158 at 25° C.

Identification—Add, with vigorous shaking, a few drops of silver ammonium nitrate T.S. to a mixture of 5 cc. of Solution of Chloroazodin and 5 cc. of distilled water: a brick red precipitate is produced, which is soluble in an excess of ammonia T.S.

Moisture—Determine the moisture present in 150 cc. of Solution of Chloroazodin as directed under *Moisture Method by Toluene Distillation*, page 629: not more than 0.3 cc. of water is present.

Assay for chloroazodin—Measure accurately about 5 cc. of Solution of Chloroazodin into a 250-cc. flask, and dilute it with 25 cc. of chloroform. Add 10 cc. of potassium iodide T.S., followed by 75 cc. of diluted acetic acid, and immediately titrate the liberated iodine with hundredth-normal sodium thiosulfate, shaking vigorously during the titration and adding a few drops of starch T.S. near the end of the titration. Each cc. of hundredth-normal sodium thiosulfate is equivalent to 0.000306 Gm. of $C_2H_4Cl_2N_6$.

Storage—Preserve Solution of Chloroazodin in tight, light-resistant containers.

LIQUOR CRESOLIS SAPONATUS

Saponated Solution of Cresol

Liq. Cresol. Sap.—Compound Solution of Cresol

Saponated Solution of Cresol contains, in each 100 cc., not less than 46 cc. and not more than 52 cc. of cresol. It is prepared by the saponification of a mixture of vegetable oils, excluding coconut and palm kernel oils, and cresol. The vegetable oil may be corn, cottonseed, linseed, or soya bean, or similar oils which have a saponification value, page 579, not greater than 205, and an iodine value, page 579, not less than 100.

Saponated Solution of Cresol may be prepared extemporaneously in the following manner:

CRESOL.....	500	cc.
THE VEGETABLE OIL.....	350	cc.
ALCOHOL.....	55	cc.
POTASSIUM HYDROXIDE.....	72.6	Gm.
DISTILLED WATER, a sufficient quantity,		
To make.....	1000	cc.

Mix the vegetable oil and the alcohol. Dissolve the potassium hydroxide in 100 cc. of distilled water and immediately add the hot solution to the oil while vigorously stirring the mixture with a mechanical stirrer. Continue the stirring until a small portion of the soap dissolves in hot distilled water to form a clear solution. Add the cresol to the

soap, stir until a clear solution is obtained, and add sufficient distilled water to make the Solution measure 1000 cc.

NOTE—If desired, 58.08 Gm. of the potassium hydroxide may be replaced by 37.05 Gm. of sodium hydroxide. It is also permissible to omit the alcohol, in which case the oil should be warmed to 85° C. before the addition of the solution of the alkali, and the mixture heated, if necessary to complete saponification.

The quantities of potassium hydroxide and sodium hydroxide here directed have been determined upon the basis of the official minimum percentages of strength, namely, 85 per cent and 95 per cent, respectively. If either or both of the hydroxides used should have a different percentage of strength, corresponding alterations in the quantities should be made.

Characteristics of the liberated fatty acids—Place 50 cc. of Saponated Solution of Cresol in a 1500-cc. round-bottom flask and add 100 cc. of distilled water and 30 cc. of diluted sulfuric acid. Connect the flask with a source of steam and a condenser and distil briskly with steam until 3 cc. of distillate produces not more than a faint opalescence upon the addition of 1 cc. of bromine T.S. Transfer the residual liquid to a separator, cool to room temperature, add 50 cc. of ether, shake well, and allow the layers to separate. Draw off the water layer as completely as possible and wash the ether layer three times with 50-cc. portions of cold distilled water, rejecting the washings. Transfer the ether layer to a small flask, containing 15 Gm. of anhydrous sodium sulfate, shake well, and decant the ether solution through a dry filter into a dry beaker. Carefully evaporate the ether and dry the mixed fatty acids at 105° C. for 1 hour. The acid value of the fatty acids is not more than 205, using about 1 Gm. of the fatty acids, accurately weighed, page 578, and the iodine value of the fatty acids is not less than 95, using from 0.15 to 0.2 Gm. of the fatty acids, accurately weighed, page 579.

Assay—Mix in a 500-cc. distilling flask 50 cc. of Saponated Solution of Cresol, accurately measured at 25° C., with 150 cc. of purified kerosene. Add 3 Gm. of sodium bicarbonate, and distil the mixture, using an upright condenser, at the rate of not more than 2 drops per second, until the distillate comes over strongly yellow, receiving the distillate in a 250-cc. to 300-cc. separator. Draw off the lower aqueous layer, shake the kerosene layer with 10 cc. of sulfuric acid (49 to 51 per cent by weight), allow to stand for 2 hours, then draw off the acid layer completely, and discard it. Add to the kerosene layer 40 cc. of a 15 per cent aqueous solution of sodium hydroxide, accurately measured at 25° C., shake well for 5 minutes, then allow to stand until complete separation has taken place, and draw off the sodium hydroxide layer into a graduated cylinder. Shake the kerosene layer again with a fresh portion of 20 cc. of the 15 per cent sodium hydroxide solution, accurately measured at 25° C., allow the two layers to separate completely, and draw off the sodium hydroxide layer into the graduated cylinder. Adjust the sodium hydroxide solution in the graduated cylinder to a temperature of 25° C., and note its volume. The difference between the volume noted and the total volume of sodium hydroxide solution used represents the volume of cresol present in 50 cc. of Saponated Solution of Cresol. This difference is not less than 23 cc. and not more than 26 cc.

Transfer the sodium hydroxide solution of the cresol obtained in the assay to a separator, and add sufficient hydrochloric acid to render the solution distinctly acid. Allow the liberated cresol to separate completely, and draw off the lower aqueous layer. Wash the cresol with several successive portions of 20 cc. each of a saturated aqueous solution of calcium chloride until the washings are neutral or only slightly acid. Then add to the washed cresol about 5 Gm. of coarsely granular (about a No. 4 mesh) anhydrous calcium chloride, shake gently at frequent inter-

vals during 3 hours, and allow to stand over night. Decant the clear liquid completely into a graduated 25-cc. cylinder and note its volume. Transfer the dehydrated cresol to a 50- to 60-cc. distilling flask, and distil as directed by Method II under *Boiling and Distilling Temperatures*, page 559, at the rate of about 1.5 cc. per minute, receiving the distillate in the cylinder in which the cresol was measured. At least 90 per cent of the volume of cresol taken distills between 195° and 205° C.

Storage—Preserve Saponated Solution of Cresol in tight containers.

Alcohol content—Not more than 5 per cent, by volume, of C_2H_5OH .

LIQUOR EPINEPHRINÆ HYDROCHLORIDI

Solution of Epinephrine Hydrochloride

Liq. Epineph. Hydrochlor.—Solution of Epinephrine Hydrochloride 1:1000

Solution of Epinephrine Hydrochloride is a solution of epinephrine hydrochloride in distilled water, and has a potency equivalent to a solution containing 1 Gm. of U. S. P. Epinephrine Reference Standard in each 1000 cc.

Description—Solution of Epinephrine Hydrochloride is a nearly colorless, slightly acid liquid, gradually turning dark on exposure to air and light. If the solution becomes brown in color, or contains a precipitate, it must be rejected.

Identification—The addition of 1 drop of ferric chloride T.S. to 10 cc. of Solution of Epinephrine Hydrochloride produces an emerald green color which soon changes to cherry red and finally to brown.

Assay—

Standard Solution of Epinephrine Hydrochloride—Dissolve 50 mg. of U. S. P. Epinephrine Reference Standard in 5 cc. of tenth-normal hydrochloric acid and dilute to 50 cc. with distilled water, to make a 1 in 1000 solution. Preserve this solution in a tightly stoppered hard-glass container and, except when in use, store under refrigeration and protected from light. This solution must not be used if it shows any evidence of deterioration, such as change in color, or if it has been prepared for more than 6 months.

Preparation of the test dilutions—On the day of the assay, prepare test dilutions of both the Standard Solution of Epinephrine Hydrochloride and of the Solution of Epinephrine Hydrochloride to be assayed, using sufficient isotonic solution of sodium chloride so that upon injection into the animal prepared for the assay as described on page 267, a dose of not less than 0.5 cc. and not more than 1.5 cc. will be required to produce a rise in blood pressure equivalent to 30 to 60 mm. of mercury. Discard any test dilution in which a trace of pink color develops.

Preparation of the animal—Using an anesthetic substance suitable for maintenance of a uniform level of blood pressure, anesthetize a dog of medium size deeply enough to prevent the occurrence of muscular movements such as shivering or twitching. At room temperature below 25° C., protect the animal from excess loss of body heat by covering it, or by the application of artificial heat. If preferable or necessary, expose the trachea and insert a cannula so that the animal may receive artificial respiration during the course of the assay. Insert into a carotid artery a cannula connected to a mercury manometer and arrange to record the blood pressure of the animal upon a kymograph. Expose a femoral vein and inject into it 0.1 cc. per Kg. of the dog's weight of a 1.0 per cent solution of atropine sulfate in distilled water. Consider the vagal receptor mechanism sufficiently paralyzed only if subsequent intravenous injections of 0.1 cc. per Kg. of a 0.01 per cent solution of acetyl choline chloride prepared within 24 hours, in distilled water, fail to elicit any decrease in blood pressure. If the vagal receptor mechanism is insufficiently paralyzed, inject in doses of 0.05 cc. per Kg. the above-designated atropine sulfate solution until the paralysis is complete.

Test of the animal preparation—Test the uniformity of the responses and the sensitivity of the animal by the following procedure, discarding any animal which fails to meet these tests. Select two doses of the test dilution of the standard differing in amount by no more than 20 per cent of the smaller dose and which upon injection cause rises in blood pressure between 30 and 60 mm. of mercury. Make two or more injections of each of these selected doses alternately. Make these and subsequent injections of test dilutions at regular intervals of time which shall be not less than 5 minutes and long enough to allow the blood pressure to return to approximately its former level. Measure the rises in blood pressure to the nearest mm. of mercury. Determine the average rise corresponding to each dosage level and the difference between the two or more responses to the same dosage. Consider the animal preparation satisfactory for purposes of this assay if the difference between the two averages is at least 5 mm. of mercury and at least twice the maximum difference observed in the values going to make up each average.

Comparison of the test dilutions—At regular intervals, make alternate injections of the test dilutions of the Standard Solution of Epinephrine and of the Solution of Epinephrine Hydrochloride to be assayed. Vary the dosage of the latter if necessary until the amount is found which, in at least two successive injections, raises the blood pressure between 30 and 60 mm. of mercury and to heights equivalent to those observed following the alternate injections of the Standard Solution of Epinephrine, indicating that the amount of active agent is the same in the doses used. Consider as equivalent any four successive rises in blood pressure if the difference between the lowest and highest of them does not exceed one-half the difference between the two average rises obtained in standardizing the animal preparation. From the results thus obtained, calculate the strength of the unknown and adjust as necessary.

NOTE—Evidence of potency within 5 per cent below and 5 per cent above the standard is acceptable.

Storage—Preserve Solution of Epinephrine Hydrochloride in small, well-filled, light-resistant, tight containers.

LIQUOR FORMALDEHYDI

Solution of Formaldehyde

Liq. Formaldehyd.

Solution of Formaldehyde is an aqueous solution containing not less than 37 per cent of CH_2O , with variable amounts of methanol to prevent polymerization.

Description—Solution of Formaldehyde is a clear, colorless or nearly colorless liquid, having a pungent odor. The vapor from Solution of Formaldehyde irritates the mucous membrane of the throat and nose. On long standing, especially in the cold, Solution of Formaldehyde sometimes becomes cloudy, due to the separation of paraformaldehyde.

Solubility—Solution of Formaldehyde is miscible with water and with alcohol.

Identification—

- A: Dilute 2 cc. of Solution of Formaldehyde with 10 cc. of distilled water in a test tube, and add 1 cc. of silver ammonium nitrate T.S.: metallic silver is produced either in the form of a finely divided, gray precipitate, or as a bright, metallic mirror on the sides of the test tube.
- B: Add 2 drops of Solution of Formaldehyde to 5 cc. of sulfuric acid in which about 20 mg. of salicylic acid has been dissolved, and warm the liquid very gently: a permanent, deep red color appears.

Free acid—Measure 20 cc. of Solution of Formaldehyde into a flask containing 20 cc. of distilled water, add 2 drops of bromothymol blue T.S., and titrate with normal sodium hydroxide: not more than 1 cc. of the standard alkali is consumed.

Assay—Transfer about 3 cc. of Solution of Formaldehyde to a tared flask containing 10 cc. of distilled water, stopper the flask tightly, and determine the exact weight of the Solution taken. Add 50 cc. of normal sodium hydroxide, and follow this immediately but slowly, through a small funnel, with 50 cc. of hydrogen peroxide T.S. that has been previously neutralized to bromothymol blue T.S. with normal sodium hydroxide. Heat the mixture cautiously on a water bath for 5 minutes, shaking it occasionally. Allow the mixture to cool, rinse the funnel and inner wall of the flask with distilled water, and after allowing it to stand for 30 minutes, add from 2 to 5 drops of bromothymol blue T.S., and titrate the excess of alkali with normal sulfuric acid. Each cc. of normal sodium hydroxide is equivalent to 0.03003 Gm. of CH_2O .

Storage—Preserve Solution of Formaldehyde in tight containers, preferably at a temperature not below 25°C .

LIQUOR HEPATIS

Solution of Liver

Liq. Hepat.—Liquid Extract of Liver

Solution of Liver is a brownish liquid, and contains that soluble thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood of persons suffering from pernicious anemia. The approximate anti-anemic potency of Solution of Liver in pernicious anemia is expressed in U. S. P. Units and conforms to all other provisions outlined under Anti-anemia Preparations, page 553.

Alcohol and glycerin content—From 12 to 25 per cent, by volume, of $\text{C}_2\text{H}_5\text{OH}$, and not more than 40 per cent, by volume, of $\text{C}_3\text{H}_5(\text{OH})_3$.

Storage—Preserve Solution of Liver in well-closed containers, preferably at a temperature not above 20°C ., and protected from light.

AVERAGE DAILY DOSE—One U. S. P. Unit.

LIQUOR HYDROGENII PEROXIDI

Solution of Hydrogen Peroxide

Liq. Hydrog. Perox.—Solution of Hydrogen Dioxide

Solution of Hydrogen Peroxide is an aqueous solution containing, in each 100 cc., not less than 2.5 Gm. and not more than 3.5 Gm. of H_2O_2 .

Description—Solution of Hydrogen Peroxide is a colorless liquid, odorless, or having an odor resembling that of ozone. It is slightly acid to the taste and produces a froth in the mouth. It usually deteriorates upon keeping or upon protracted agitation, and rapidly decomposes when in contact with many oxidizing as well

as reducing substances. When rapidly heated, it may decompose suddenly. It is affected by light.

Specific gravity—The specific gravity of Solution of Hydrogen Peroxide is about 1.01 at 25° C.

Identification—Shake 1 cc. of Solution of Hydrogen Peroxide with 10 cc. of distilled water containing 1 drop of diluted sulfuric acid, and add 2 cc. of ether: the subsequent addition of a drop of potassium dichromate T.S. produces an evanescent blue color in the aqueous layer. Upon agitation and standing, this blue color passes into the ethereal layer.

Reaction—Solution of Hydrogen Peroxide is slightly acid to litmus paper.

Non-volatile matter—Evaporate 20 cc. of Solution of Hydrogen Peroxide to dryness on a water bath, and dry the residue for 1 hour at 105° C.: the weight of the residue does not exceed 30 mg.

Acidity—It requires not more than 2.5 cc. of tenth-normal sodium hydroxide to neutralize 25 cc. of Solution of Hydrogen Peroxide, using phenolphthalein T.S. as the indicator.

Arsenic—Add 1 cc. of ammonia T.S. to 1 cc. of Solution of Hydrogen Peroxide, and evaporate the liquid to dryness on a water bath: the residue meets the requirements of the test for *arsenic*, page 554.

Barium—The addition of 2 drops of diluted sulfuric acid to 10 cc. of Solution of Hydrogen Peroxide produces no turbidity or precipitate in the mixture within 10 minutes.

Heavy metals—Dilute 5 cc. of Solution of Hydrogen Peroxide with 20 cc. of distilled water, add 2 cc. of ammonia T.S., and gently boil the solution until the volume is reduced to about 5 cc. Add 3 cc. of diluted acetic acid, and dilute with distilled water to 25 cc.; the heavy metals limit, page 586, for Solution of Hydrogen Peroxide is 5 parts per million.

Limit of preservative—Extract 100 cc. of Solution of Hydrogen Peroxide in a separator with a mixture of 3 volumes of chloroform and 2 volumes of ether, using 50 cc., 25 cc., and 25 cc., respectively, and evaporate the combined extractions to dryness at room temperature in a tared glass dish: the residue, if any, weighs not more than 50 mg.

Assay—Measure accurately 2 cc. of Solution of Hydrogen Peroxide, and transfer it to a suitable flask containing 20 cc. of distilled water. Add 20 cc. of diluted sulfuric acid, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.001701 Gm. of H_2O_2 .

Storage—Preserve Solution of Hydrogen Peroxide in tight, light-resistant containers, preferably at a temperature not above 35° C.

LIQUOR IODI

Solution of Iodine

Liq. Iodi

Solution of Iodine contains, in each 100 cc., not less than 1.8 Gm. and not more than 2.2 Gm. of iodine (I), and not less than 2.1 Gm. and not more than 2.6 Gm. of NaI.

IODINE.....	20 Gm.
SODIUM IODIDE.....	24 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the iodine and sodium iodide in 50 cc. of distilled water, then add sufficient distilled water to make the product measure 1000 cc.

Description—Solution of Iodine is a transparent liquid, having a reddish brown color and the odor of iodine.

Identification—Add 1 drop of Solution of Iodine to a mixture of 1 cc. of starch T.S. and 9 cc. of distilled water: a deep blue color is produced.

Assay for iodine—Proceed as directed under *Liquor Iodi Fortis*, page 270.

Assay for sodium iodide—Proceed as directed under *Liquor Iodi Fortis*, page 270.

The difference between the number of cc. of twentieth-molar potassium iodate used and the number of cc. of tenth-normal potassium arsenite used, multiplied by 0.01499, equals the number of Gm. of NaI in the volume of Solution taken for the assay.

Storage—Preserve Solution of Iodine in tight containers, preferably at a temperature not above 35° C.

LIQUOR IODI FORTIS

Strong Solution of Iodine

Liq. Iodi Fort.—Liquor Iodi Compositus U. S. P. XI, Compound Solution of Iodine U. S. P. XI, Lugol's Solution

Strong Solution of Iodine is an aqueous solution containing, in each 100 cc., not less than 4.5 Gm. and not more than 5.5 Gm. of iodine (I), and not less than 9.5 Gm. and not more than 10.5 Gm. of KI.

IODINE.....	5 Gm.
POTASSIUM IODIDE.....	10 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	100 cc.

Dissolve the iodine and potassium iodide in 10 cc. of distilled water, then add a sufficient quantity of distilled water to make the product measure 100 cc.

Description—Strong Solution of Iodine is a transparent liquid having a deep brown color and the odor of iodine.

Identification—A drop of Strong Solution of Iodine added to 1 cc. of starch T.S., previously diluted with 10 cc. of distilled water, produces a deep blue color.

Assay—Place exactly 5 cc. of Strong Solution of Iodine in a 500-cc. glass-stoppered flask, and add 25 cc. of distilled water. Titrate with tenth-normal potassium arsenite, using starch T.S. as the indicator. Each cc. of tenth-normal potassium arsenite is equivalent to 0.01269 Gm. of I. To the titration mixture add 50 cc. of hydrochloric acid and 5 cc. of chloroform, and cool to room temperature. Titrate with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. The last portions of the iodate solution must be added in drops, the mixture being agitated vigorously and continuously.

After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, the mixture should be titrated further with the iodate solution. The difference between the number of cubic centimeters of twentieth-molar potassium iodate used and the number of cubic centimeters of tenth-normal potassium arsenite used, multiplied by 0.01660 equals the number of Gm. of KI in the Solution taken for the assay.

Storage—Preserve Strong Solution of Iodine in tight containers, preferably at a temperature not above 35° C.

AVERAGE DOSE—Metric, 0.3 cc.—Apothecaries, 5 minims.

LIQUOR MAGNESII CITRATIS

Solution of Magnesium Citrate

Liq. Mag. Cit.

Solution of Magnesium Citrate contains, in each 100 cc., an amount of magnesium citrate corresponding to not less than 1.6 Gm. and not more than 1.9 Gm. of MgO.

MAGNESIUM CARBONATE.....	15	Gm.
CITRIC ACID.....	33	Gm.
SYRUP.....	60	cc.
PURIFIED TALC.....	5	Gm.
OIL OF LEMON.....	0.1	cc.
POTASSIUM BICARBONATE.....	2.5	Gm.
DISTILLED WATER, a sufficient quantity,		
To make.....	350	cc.

Dissolve the citric acid in 150 cc. of hot distilled water in a suitable dish, and, having added the magnesium carbonate, previously mixed with 100 cc. of distilled water, stir until it is dissolved. Then add the syrup, heat the mixed liquids to the boiling point, immediately add the oil of lemon, previously triturated with the purified talc, and filter the mixture, while hot, into a strong bottle (previously rinsed with boiling distilled water) of suitable capacity. Add enough boiled distilled water to make the product measure 350 cc. Stopper the bottle with purified cotton, allow to cool, drop in the potassium bicarbonate, and immediately stopper the bottle securely. Lastly, shake the solution occasionally until the potassium bicarbonate is dissolved. Keep the bottle on its side in a cool place, preferably in a refrigerator.

NOTE—In this process the 2.5 Gm. of potassium bicarbonate may be replaced by 2.1 Gm. of sodium bicarbonate, preferably in tablet form

and, in addition, the Solution may be carbonated by the use of CO_2 , under pressure.

The stability of Solution of Magnesium Citrate is improved by adjusting the quantity of magnesium carbonate for each 350 cc. of Solution so that it corresponds to 6.0 Gm. of MgO and by sterilizing the Solution after it has been bottled.

Description—Solution of Magnesium Citrate is a colorless to slightly yellow, clear effervescent liquid, having a sweet, acidulous taste and a lemon flavor.

Identification—

A: * Solution of Magnesium Citrate responds to the tests for magnesium, page 590.

B: To 5 cc. of Solution of Magnesium Citrate add 1 cc. of potassium permanganate T.S. and 5 cc. of mercuric sulfate T.S., and heat the solution: a white precipitate is formed.

Chloride—A 2-cc. portion of Solution of Magnesium Citrate shows no more *chloride* than corresponds to 0.3 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 2-cc. portion of Solution of Magnesium Citrate shows no more *sulfate* than corresponds to 0.3 cc. of fiftieth-normal sulfuric acid, page 626.

Tartaric acid—Add 1 cc. of glacial acetic acid and 3 cc. of an aqueous solution of potassium acetate (1 in 2) to 10 cc. of Solution of Magnesium Citrate in a test tube, shake the mixture vigorously, then gently rub the inner wall of the test tube with a glass rod for a few minutes, and allow to stand for 1 hour: no white, crystalline precipitate soluble in ammonia T.S. is produced.

Minimum of total citric acid—Measure accurately 10 cc. of Solution of Magnesium Citrate into a 250-cc. beaker. Gently agitate the contents for 2 minutes, then dilute with 30 cc. of distilled water. Add 3 drops of phenolphthalein T.S. and just enough normal sodium hydroxide to give the liquid a persistent pink color, and then acidify with 4 drops of normal hydrochloric acid. Add 20 cc. of calcium chloride T.S., and concentrate, by boiling, to about 30 cc., stirring constantly with a rubber-tipped glass rod during the boiling. Completely transfer the precipitate from the hot mixture to a filter of from 9 to 11 cm. in diameter with the aid of small quantities of boiling distilled water. Then wash the precipitate five times with boiling distilled water. Collect the filtrate and washings in a 150-cc. beaker, and concentrate the solution, by boiling, to about 20 cc. Add sufficient ammonia T.S., drop by drop, to give the liquid a distinct red color, and then concentrate to about 10 cc. Transfer the precipitate completely from the hot mixture to a filter of from 7 to 9 cm. in diameter with the aid of small quantities of boiling distilled water, and wash the precipitate six times with 5-cc. portions of boiling distilled water.

Dry the two filters with the precipitates, and incinerate them together in a loosely covered platinum crucible, heating at first at a low temperature until the precipitates are well charred, and then removing the cover and raising the temperature until the residue is nearly white. If a gas flame is used, it must not come in contact with the mass in the crucible. Cool, place the crucible with its contents in a suitable beaker, add about 30 cc. of distilled water, and then exactly 50 cc. of half-normal hydrochloric acid. When the residue has dissolved, remove the crucible, rinsing it well with distilled water into the beaker. Add 100 cc. of distilled water, cover the beaker with a watch glass, and boil gently for 10 minutes. Cool and titrate the excess of acid with half-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Not less than 26 cc. of half-normal hydrochloric acid is consumed.

Assay for magnesium oxide—Transfer to a beaker of about 200-cc. capacity exactly 10 cc. of Solution of Magnesium Citrate which has been previously freed from excessive carbon dioxide by repeated pouring. Add 100 cc. of distilled water, 2 cc. of hydrochloric acid, 20 cc. of sodium phosphate T.S., and 2 drops of methyl red T.S. Add ammonia T.S., a few drops at a time, with constant stirring, until the solution becomes faintly yellow. Allow the mixture to stand for 10 minutes, add

40 cc. of stronger ammonia T.S., with constant stirring, and allow the mixture to stand for 2 hours or over night. Collect the precipitate in a tared Gooch crucible, and wash with a mixture of 1 volume of ammonia T.S. and 3 volumes of distilled water until free from chloride. Dry and ignite to constant weight. The weight of magnesium pyrophosphate ($Mg_2P_2O_7$) so obtained, multiplied by 3.621, indicates the weight of magnesium oxide represented by 100 cc. of the Solution.

AVERAGE DOSE—Metric, 200 cc.—Apothecaries, 7 fluidounces.

LIQUOR POTASSII ARSENITIS

Solution of Potassium Arsenite

Liq. Pot. Arsen.—Fowler's Solution, Solutio arsenicalis seu Fowleri P.I.

Solution of Potassium Arsenite contains, in each 100 cc., the equivalent of not less than 0.95 Gm. and not more than 1.05 Gm. of As_2O_3 .

ARSENIC TRIOXIDE.....	10 Gm.
POTASSIUM BICARBONATE.....	7.6 Gm.
ALCOHOL.....	30 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Boil the potassium bicarbonate and arsenic trioxide in a flask with 100 cc. of distilled water until solution is effected. Cool the solution, and transfer it to a 1000-cc. graduated container, rinsing the flask in which the liquid was boiled with several portions of distilled water to make a solution measuring 950 cc. Add the alcohol and sufficient distilled water to make the solution measure 1000 cc. Mix thoroughly, and filter.

Description—Solution of Potassium Arsenite is a clear, colorless liquid, alkaline to litmus paper.

Identification—Add to 10 cc. of Solution of Potassium Arsenite an excess of hydrochloric acid and an equal volume of hydrogen sulfide T.S.: a yellow precipitate is produced which is soluble in ammonium carbonate T.S.

Arsenate—Acidulate 4 cc. of Solution of Potassium Arsenite with diluted nitric acid, add 1 cc. of silver nitrate T.S., and superimpose a layer of ammonia T.S. upon this liquid: no red or reddish brown color is observed at the line of contact.

Assay—Measure exactly 20 cc. of Solution of Potassium Arsenite, dilute with 75 cc. of distilled water, acidify the mixture very slightly with diluted hydrochloric acid, then dissolve in the solution 2 Gm. of sodium bicarbonate, and titrate the resulting liquid with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.004946 Gm. of As_2O_3 .

Alcohol content—From 1 to 3 per cent, by volume, of C_2H_5OH .

Storage—Preserve Solution of Potassium Arsenite in tight containers.

AVERAGE DOSE—Metric, 0.2 cc.—Apothecaries, 3 minims.

LIQUOR SODII CHLORIDI ISOTONICUS

Isotonic Solution of Sodium Chloride

Liq. Sod. Chlor. Isoton.—Liquor Sodii Chloridi Physiologicus U. S. P. XI, Physiological Solution of Sodium Chloride, U. S. P. XI, Physiological Salt Solution, Normal Saline Solution

Isotonic Solution of Sodium Chloride contains, in each 100 cc., not less than 0.88 Gm. and not more than 0.92 Gm. of NaCl.

Unless otherwise specified, No. 3—Sterile Isotonic Solution of Sodium Chloride for Parenteral Use must be dispensed.

No. 1—Non-sterile Isotonic Solution of Sodium Chloride

SODIUM CHLORIDE.....	9 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the Sodium Chloride in sufficient distilled water to make 1000 cc., and filter, returning the filtrate until free from suspended particles.

No. 2—Sterile Isotonic Solution of Sodium Chloride Not for Parenteral Use

Prepare the Solution as directed under No. 1, and sterilize preferably by Process C. See *Sterilization Processes*, page 614. The Solution meets the *Sterility Test for Liquids*, page 609.

No. 3—Sterile Isotonic Solution of Sodium Chloride for Parenteral Use

Prepare the Solution as directed under No. 1, replacing the distilled water by water for injection. Place the Solution in suitable containers and sterilize preferably by Process C. See *Sterilization Processes*, page 614. The Solution meets the *Sterility Test for Liquids*, page 609, and the *Pyrogen Test*, page 606. It also conforms to the other requirements given under *Injectiones*, page 219. Bacteriostatic agents must not be added.

Description—Isotonic Solution of Sodium Chloride is a clear, colorless solution possessing a slightly saline taste.

Hydrogen-ion concentration—The pH of Isotonic Solution of Sodium Chloride is from 5 to 7.

Identification—Isotonic Solution of Sodium Chloride responds to the tests for sodium, page 592, and for chloride, page 589.

Heavy metals—To 20 cc. of Isotonic Solution of Sodium Chloride, add 2 cc. of diluted acetic acid and dilute with distilled water to 25 cc.: the heavy metals limit (page 586) for Isotonic Solution of Sodium Chloride is 0.3 part per million.

Arsenic—A 20-cc. portion of Isotonic Solution of Sodium Chloride meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfuric and sulfurous acids.

Assay—Measure accurately 25 cc. of Isotonic Solution of Sodium Chloride into a

200-cc. volumetric flask, and dilute with 50 cc. of distilled water. Add, while agitating, exactly 50 cc. of tenth-normal silver nitrate, then add 5 cc. of nitric acid and sufficient distilled water to make exactly 200 cc., and mix well. Filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate; then titrate the excess of silver nitrate in exactly 100 cc. of the subsequent filtrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.005845 Gm. of NaCl.

Storage—Preserve Sterile Solutions in hermetic or other suitable containers. See *Containers for Injections*, page 567.

Note—Aqueous Solution of Sodium Chloride of a lower or higher concentration of sodium chloride than the official Isotonic Solution of Sodium Chloride must not be dispensed when the Isotonic Solution is prescribed.

The title **Hypotonic Solution of Sodium Chloride** applies to solutions which contain less than 0.88 Gm. of sodium chloride in each 100 cc., and the title **Hypertonic Solution of Sodium Chloride** applies to solutions which contain more than 0.92 Gm. of sodium chloride in each 100 cc., and such solutions should be so labeled when dispensed, and the proportion or the weight of sodium chloride in a given volume must be indicated on the label.

LIQUOR SODII CITRATIS ANTICOAGULANS

Anticoagulant Solution of Sodium Citrate

Liq. Sod. Cit. Anticoag.

Anticoagulant Solution of Sodium Citrate is a solution of sodium citrate in isotonic solution of sodium chloride and contains, in each 100 cc., not less than 2.3 Gm. and not more than 2.7 Gm. of sodium citrate ($\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 2\text{H}_2\text{O}$), and not less than 0.85 Gm. and not more than 0.95 Gm. of sodium chloride (NaCl), including all tolerances.

Unless otherwise specified, No. 3—Sterile Anticoagulant Solution of Sodium Citrate for Parenteral Use must be dispensed.

No. 1—Non-sterile Anticoagulant Solution of Sodium Citrate

SODIUM CITRATE.....	25 Gm.
SODIUM CHLORIDE.....	9 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the salts in sufficient distilled water to make 1000 cc. and filter, returning the filtrate until it is free from suspended particles.

No. 2—Sterile Anticoagulant Solution of Sodium Citrate Not for Parenteral Use

Prepare the Solution as directed under No. 1 and sterilize preferably by Process C. See *Sterilization Processes*, page 614. The Solution meets the *Sterility Test for Liquids*, page 609.

No. 3—Sterile Anticoagulant Solution of Sodium Citrate for Parenteral Use

Prepare the Solution as directed under No. 1, replacing the distilled water by water for injection. Place the Solution in suitable containers and sterilize preferably by Process C. See *Sterilization Processes*, page 614. The Solution meets the *Sterility Test for Liquids*, page 609, and, when diluted with water for injection to contain 0.5 per cent of sodium citrate, meets the *Pyrogen Test*, page 606. It also conforms to the other requirements given under *Injectiones*, page 219. Bacteriostatic agents must not be added.

Variation in content of sodium citrate—Anticoagulant Solutions of Sodium Citrate for parenteral use may differ in sodium citrate content from that indicated above, but they must all conform to the requirements set forth in the preceding paragraph, and to the physical properties and tests described below. The label of such solutions must indicate the percentage or amount of sodium citrate per unit of volume, and the content of sodium citrate of such solutions, as determined by the assay method given below, is not less than 92 per cent and not more than 108 per cent of the labeled amount.

Description—Anticoagulant Solution of Sodium Citrate is a clear, colorless solution possessing a slightly saline taste.

Identification—The Solution, evaporated to a concentration of 1 in 20, responds to the tests for sodium, page 592, citrate, page 589, and chloride, page 589.

Hydrogen-ion concentration—The pH of the Solution is not less than 6.7 and not more than 7.5.

Limit of sodium chloride—Measure accurately 20 cc. of the solution into a 200-cc. volumetric flask, and dilute with about 50 cc. of distilled water. Add, while agitating, exactly 50 cc. of tenth-normal silver nitrate, then add 5 cc. of nitric acid and sufficient distilled water to make exactly 200 cc., and mix well. Filter through a dry filter, rejecting the first 20 cc. of the filtrate, then titrate the excess of silver nitrate in exactly 100 cc. of the subsequent filtrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.005845 Gm. of NaCl.

Assay for sodium citrate—Measure accurately 25 cc. of the Solution, evaporate to dryness, and carefully ignite the residue until it is thoroughly charred. Then proceed as described under *Alkali Salts of Organic Acids*, page 553, beginning with "After allowing the carbonized mass to cool." Each cc. of half-normal sulfuric acid is equivalent to 0.04902 Gm. of $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 2\text{H}_2\text{O}$.

Storage—Preserve Sterile Solutions in hermetic or other suitable containers. See *Containers for Injections*, page 567.

LIQUOR SODII HYPOCHLORITIS

Solution of Sodium Hypochlorite

Liq. Sod. Hypochlor.

Solution of Sodium Hypochlorite contains not less than 4 per cent and not more than 6 per cent of NaOCl.

Caution—This Solution is not suitable for application to wounds.

Description—Solution of Sodium Hypochlorite is a clear, pale, greenish yellow liquid, having an odor of chlorine. It is affected by light.

Identification—

A: Solution of Sodium Hypochlorite at first colors red litmus paper blue and then bleaches it.

B: The addition of diluted hydrochloric acid to Solution of Sodium Hypochlorite causes an evolution of chlorine.

C: The solution obtained in *identification test B* responds to the flame test for sodium, page 592.

Assay—Weigh accurately, in a glass-stoppered flask, about 3 cc. of Solution of Sodium Hypochlorite, and dilute it with 50 cc. of distilled water. Add 2 Gm. of potassium iodide and 10 cc. of acetic acid, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003723 Gm. of NaOCl.

Storage—Preserve Solution of Sodium Hypochlorite in tight, light-resistant containers, preferably at a temperature not above 25° C.

NOTE—If “*Labarraque’s Solution*” is ordered, Solution of Sodium Hypochlorite, diluted with an equal volume of water, is to be dispensed.

LIQUOR TRIBROMOÆTHANOLIS

Solution of Tribromoethanol

Liq. Tribromoæth—Solution of Tribromoethyl Alcohol

A solution of tribromoethanol in amylene hydrate containing, in each 100 cc., not less than 99 Gm. and not more than 101 Gm. of $C_2H_5Br_3O$.

TRIBROMOETHANOL.....	100 Gm.
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AMYLENE HYDRATE, a sufficient quantity	
--	--

To make.....	100 cc.
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Dissolve the tribromoethanol in 50 cc. of amylene hydrate, and add sufficient amylene hydrate to make 100 cc.

Note—For use as an anesthetic, dilute the Solution of Tribromoethanol with warm distilled water in the proportion of 2.5 cc. of Solution to 100 cc. of the dilution. Mix 5 cc. of this dilution with 1 drop of Congo red T.S.: it has the same color as a mixture of 5 cc. of distilled water and 1 drop of Congo red T.S.

Description—Solution of Tribromoethanol is a clear, colorless liquid, having a camphoraceous odor and a burning taste.

Free acid—Add 1.0 cc. of Solution of Tribromoethanol to 40 cc. of distilled water at a temperature of 40° C. in a glass-stoppered flask. Shake the mixture vigorously until all globules have disappeared. Immediately place 5 cc. of the resulting solu-

tion in a clean glass test tube and add 1 drop of an aqueous solution of Congo red (1 in 1000). The color produced is the same as that produced by the addition of 1 drop of the Congo red solution to 5 cc. of distilled water in a similar test tube.

Assay—Place 2 cc. of Solution of Tribromoethanol, accurately measured with a transfer pipette, in a 300-cc. flask, add 50 cc. of sodium hydroxide T.S., and heat on a water bath under a reflux condenser for 1 hour. Rinse the condenser with 20 cc. of distilled water and add 50 cc. of diluted nitric acid. Cool the solution to 25° C., transfer it to a 200-cc. volumetric flask, and rinse the first flask with three 10-cc. portions of distilled water, adding the rinsings to the solution, and finally add sufficient distilled water to make the solution, after thorough mixing, measure exactly 200 cc. at 25° C. To 20 cc. of the resulting solution, accurately measured, add 50 cc. of tenth-normal silver nitrate, 5 cc. of nitric acid, and 5 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Perform a blank determination with the same reagents and in the same manner and make any necessary correction. Each cc. of tenth-normal silver nitrate corresponds to 0.009426 Gm. of $C_2H_3Br_3O$.

Storage—Preserve Solution of Tribromoethanol in tight, light-resistant containers, carefully dried prior to filling.

AVERAGE DOSE—For each kilogram of body weight, rectal, Metric,
0.06 cc.—Apothecaries, 1 minim.

Caution—The total amount administered should not exceed 8 cc.
for women or 10 cc. for men, regardless of weight.

LYCOPODIUM

Lycopodium

Lycopod.

Lycopodium consists of the spores of *Lycopodium clavatum* Linné (Fam. *Lycopodiaceæ*).

Lycopodium yields not more than 0.75 per cent of acid-insoluble ash, page 629.

Description—A light, yellow, very mobile powder. It is odorless and tasteless; the spores somewhat like a three-sided pyramid with convex base, from 25 to 40 microns in diameter; the outer surface reticulate, the reticulations being polygonal and formed by straight-sided delicate ridges which form a delicate fringe at the edges of the spore; when viewed with the rounded surface of the spore on the under side, a distinct triangular marking is seen, formed by the edges of the flat surfaces of the spore.

Identification—Lycopodium is not wetted by water but floats upon it; when boiled with water, it sinks. When Lycopodium is thrown into a flame, it burns with a quick flash.

Pine pollen—Lycopodium shows very few, if any, pollen grains consisting of a central, convex generative cell separating two spherical cells or wings containing air, the pollen grains from 40 to 70 microns in diameter.

Starch or dextrin—When boiled with distilled water and cooled, Lycopodium does not give a bluish, purplish, or reddish color with iodine T.S.

MAGMA MAGNESIÆ

Magnesia Magma

Magma Mag.—Milk of Magnesia

Magnesia Magma is an aqueous suspension of magnesium hydroxide containing not less than 7 per cent and not more than 8.5 per cent of $\text{Mg}(\text{OH})_2$. To minimize the action of the glass container on Magnesia Magma, 0.1 per cent of citric acid may be added.

NOTE—One-half cc. of a volatile oil or a blend of volatile oils, suitable for flavoring purposes, may be added to each 1000 cc. of Magnesia Magma.

Description—Magnesia Magma is a white, opaque, more or less viscous suspension from which varying proportions of water usually separate on standing.

Identification—A solution of 1 cc. of Magnesia Magma in 2 cc. of diluted hydrochloric acid responds to the tests for magnesium, page 590.

Reaction—Magnesia Magma is alkaline to litmus and to phenolphthalein T.S.

Soluble salts—To 5 cc. of the clear filtrate from Magnesia Magma add 3 drops of sulfuric acid, and evaporate to dryness on a water bath: the weight of residue after gentle ignition to constant weight does not exceed 8 mg.

Soluble alkalies—Transfer about 25 cc. of Magnesia Magma to a filter, and reject the first 5 cc. of filtrate. Dilute 5 cc. of the clear filtrate with 40 cc. of distilled water. Add 1 drop of methyl red T.S., and titrate the solution with tenth-normal sulfuric acid to the production of a persistent pink color: not more than 0.4 cc. of acid solution is required.

Carbonate—The addition of 2 cc. of diluted hydrochloric acid to 1 cc. of Magnesia Magma causes not more than a slight effervescence, and the resulting solution is not more than slightly turbid.

Arsenic—To 5 cc. of Magnesia Magma add sufficient diluted sulfuric acid to dissolve the magnesium hydroxide. One-half of this solution, representing 2.5 cc. of Magnesia Magma, meets the requirements of the test for *arsenic*, page 554.

Calcium—Add, in small portions, 25 cc. of a mixture of 5 cc. of sulfuric acid and 25 cc. of distilled water to 10 cc. of Magnesia Magma. Allow to cool, add 70 cc. of alcohol, and allow the mixture to stand over night. If crystals of magnesium sulfate have separated, warm the mixture to about 50° C. to dissolve them. Prepare a Gooch crucible, wash with diluted sulfuric acid, then with distilled water, ignite at dull red heat, and weigh. Transfer the precipitate to the crucible, and wash several times with a mixture of 2 volumes of alcohol and 1 volume of diluted sulfuric acid. Dry, and ignite the crucible and contents at a dull red heat to constant weight. The weight of the calcium sulfate so obtained does not exceed 26 mg.

Heavy metals—To 5 cc. of Magnesia Magma add 6 cc. of diluted hydrochloric acid, and evaporate the solution to dryness on a water bath, with frequent stirring. Dissolve the residue in 20 cc. of distilled water, and filter. Add 2 cc. of diluted acetic acid to the filtrate, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Magnesia Magma is 5 parts per million.

Assay—After thorough agitation, place about 5 Gm. of Magnesia Magma in a tared flask, stopper, and weigh accurately, add 25 cc. of normal sulfuric acid, and, after solution is complete, titrate the excess of acid with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.02917 Gm. of $\text{Mg}(\text{OH})_2$.

Storage—Preserve Magnesia Magma in tight containers, preferably at a temperature not above 35° C. It should not be permitted to freeze.

	Metric	Apothecaries
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AVERAGE DOSE—Antacid,	4 cc.—1 fluidrachm.
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Laxative,	15 cc.—4 fluidrachms.
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MAGNESII CARBONAS

Magnesium Carbonate

Mag. Carb.—Carbonate of Magnesia

Magnesium Carbonate is a basic hydrated magnesium carbonate or a normal hydrated magnesium carbonate. It contains the equivalent of not less than 40.0 per cent and not more than 43.5 per cent of MgO .

Description—Magnesium Carbonate occurs in light, white, friable masses, or as a bulky, white powder. It is odorless, and is stable in air.

Solubility—Magnesium Carbonate is practically insoluble in water, to which, however, it imparts a slightly alkaline reaction. It is insoluble in alcohol, but is dissolved by dilute acids with effervescence.

Identification—When Magnesium Carbonate is treated with diluted hydrochloric acid, it dissolves with effervescence and the resulting solution responds to the tests for magnesium, page 590.

Soluble salts—Mix 2 Gm. of Magnesium Carbonate with 100 cc. of a mixture of equal volumes of *n*-propyl alcohol and distilled water. Heat the mixture to the boiling point, with constant stirring, cool to room temperature, and filter. Evaporate 50 cc. of the filtrate to dryness on a water bath: the weight of the residue does not exceed 10 mg.

Arsenic—A solution of 0.4 Gm. of Magnesium Carbonate in 5 cc. of diluted hydrochloric acid meets the requirements of the test for arsenic, page 554, omitting the treatment with sulfurous and sulfuric acids.

Calcium oxide—Dissolve about 1 Gm. of Magnesium Carbonate, accurately weighed, in a mixture of 3 cc. of sulfuric acid and 22 cc. of distilled water. Add 50 cc. of alcohol, and allow the mixture to stand over night. If crystals of magnesium sulfate have separated, warm the mixture to about $50^{\circ} C$. to dissolve them. Filter through a Gooch crucible containing an asbestos mat which has been previously washed with diluted sulfuric acid, distilled water, and alcohol, and ignited. Wash the crystals on the mat several times with a mixture of 3 volumes of alcohol and 1 volume of distilled water. Ignite the crucible and contents at a dull red heat, cool, and weigh. The weight of calcium sulfate thus obtained, multiplied by 0.4119, gives the equivalent of calcium oxide in the Magnesium Carbonate taken for the test; this should not exceed 0.6 per cent.

Heavy metals—Dissolve 1 Gm. of Magnesium Carbonate in 10 cc. of diluted hydrochloric acid, and evaporate the solution to dryness on a water bath. Toward the end of the evaporation stir the residue frequently and disintegrate it so that finally a dry powder is obtained; dissolve the residue in 20 cc. of distilled water, and filter. To the filtrate, which should be neutral to litmus paper, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Magnesium Carbonate is 30 parts per million.

Iron—Boil 0.1 Gm. of Magnesium Carbonate with 5 cc. of a mixture of 1 volume of nitric acid and 9 volumes of distilled water for 1 minute. Cool, dilute to 50 cc. with distilled water, add 5 cc. of ammonium thiocyanate T.S., mix well, and transfer to a Nessler tube. Treat in the same manner exactly 2 cc. of a solution of ferric ammonium sulfate, made by dissolving 86.5 mg. of ferric ammonium sulfate in 10 cc. of diluted sulfuric acid and diluting it with distilled water to make 1000 cc., each cc. representing 0.01 mg. of Fe. The color of the test solution is not deeper than that of the mixture containing the standard iron solution. The comparison must be made within 5 minutes after the addition of the ammonium thiocyanate T.S.

Assay—Dissolve about 1 Gm. of Magnesium Carbonate, accurately weighed, in 30 cc. of normal sulfuric acid, and determine the residual acid by titrating with normal sodium hydroxide, using methyl orange T.S. as the indicator. From the volume of the normal sulfuric acid consumed deduct the volume of normal sulfuric acid corresponding to the content of calcium oxide in the weight of Magnesium Carbon-

are taken for the assay. The difference is the normal sulfuric acid equivalent to the magnesium oxide present. Each cc. of normal sulfuric acid is equivalent to 0.02016 Gm. of MgO or to 0.02804 Gm. of CaO.

Storage—Preserve Magnesium Carbonate in well-closed containers.

Metric Apothecaries

AVERAGE DOSE—Antacid, 0.6 Gm.—10 grains.
Laxative, 8 Gm.—2 drachms.

MAGNESII OXIDUM

Magnesium Oxide

Mag. Oxid.—Magnesia, Light Magnesia

MgO

Mol. wt. 40.32

Magnesium Oxide contains, after ignition, not less than 96 per cent of MgO.

Description—Magnesium Oxide occurs as a very bulky, white powder. It readily absorbs moisture and carbon dioxide when exposed to air.

Solubility—Magnesium Oxide is practically insoluble in water and is insoluble in alcohol. It is soluble in dilute acids.

Identification—A solution of Magnesium Oxide in diluted hydrochloric acid responds to the tests for magnesium, page 590.

Loss on ignition—Transfer to a tared platinum crucible about 0.5 Gm. of Magnesium Oxide, weigh accurately, and ignite to constant weight: the loss in weight does not exceed 10 per cent.

Soluble salts—Boil 2 Gm. of Magnesium Oxide with 100 cc. of distilled water for 5 minutes in a covered beaker, then filter while hot. Titrate 50 cc. of the cooled filtrate with tenth-normal sulfuric acid, using methyl red T.S. as the indicator: not more than 2 cc. of the acid is consumed. Evaporate 25 cc. of the filtrate in a tared dish to dryness, and dry at 120° C. for 3 hours: not more than 10 mg. of residue remains.

Carbonate—Boil a mixture of 0.1 Gm. of Magnesium Oxide with 5 cc. of distilled water, cool, and add 5 cc. of acetic acid: the Magnesium Oxide dissolves without effervescence.

Arsenic—A solution of 0.16 Gm. of Magnesium Oxide in 5 cc. of diluted hydrochloric acid meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfurous and sulfuric acids.

Calcium oxide—When tested by the method described under *Magnesii Carbonas*, page 280, using about 0.4 Gm. of freshly ignited Magnesium Oxide, accurately weighed, Magnesium Oxide yields the equivalent of not more than 1.5 per cent of calcium

Heavy metals—Test 1 Gm. of Magnesium Oxide as directed under *Magnesii Carbonas*, page 280, using 20 cc. of diluted hydrochloric acid to obtain solution: the heavy metals limit for Magnesium Oxide is 40 parts per million.

Iron—Magnesium Oxide meets the requirements of the test for *iron* under *Magnesii Carbonas*, page 280, using 42 mg. of Magnesium Oxide.

Assay—Ignite about 0.5 Gm. of Magnesium Oxide to constant weight in a tared platinum crucible, weigh the residue accurately, dissolve it in 30 cc. of normal sulfuric acid, and determine the residual acid by titrating with normal sodium

hydroxide, using methyl orange T.S. as the indicator. From the volume of the normal sulfuric acid consumed, deduct the volume of normal sulfuric acid corresponding to the content of calcium oxide in the Magnesium Oxide taken for the assay. The difference is the volume of normal sulfuric acid equivalent to the Magnesium Oxide present. Each cc. of normal sulfuric acid is equivalent to 0.02016 Gm. of MgO or to 0.02804 Gm. of CaO.

Storage—Preserve Magnesium Oxide in tight containers.

	Metric	Apothecaries
AVERAGE DOSE—Antacid,	0.25 Gm.—	4 grains.
Laxative,	4 Gm.—	60 grains.

MAGNESII OXIDUM PONDEROSUM

Heavy Magnesium Oxide

Mag. Oxid. Pond.—Heavy Magnesia

MgO

Mol. wt. 40.32

Heavy Magnesium Oxide contains, after ignition, not less than 96 per cent of MgO.

Description—Heavy Magnesium Oxide occurs as a relatively dense, white powder. It absorbs moisture and carbon dioxide when exposed to air.

Other tests—Heavy Magnesium Oxide meets the requirements for *identification, loss on ignition, soluble salts, carbonate, arsenic, calcium oxide, heavy metals, iron, and the assay* under *Magnesii Oxidum*, page 281.

Storage—Preserve Heavy Magnesium Oxide in tight containers.

	Metric	Apothecaries
AVERAGE DOSE—Antacid,	0.25 Gm.—	4 grains.
Laxative,	4 Gm.—	60 grains.

MAGNESII PHOSPHAS TRIBASICUS

Tribasic Magnesium Phosphate

Mag. Phos. Tribas.

Mg₃(PO₄)₂·5H₂O

Mol. wt. 353.00

Tribasic Magnesium Phosphate, when ignited to constant weight, contains not less than 98 per cent of Mg₃(PO₄)₂.

Description—Tribasic Magnesium Phosphate is a white, odorless, and tasteless powder.

Solubility—Tribasic Magnesium Phosphate is almost insoluble in water but is readily soluble in diluted mineral acids.

Identification—Ammonium molybdate T.S. added to a solution of Tribasic Magnesium Phosphate in diluted nitric acid produces a precipitate of yellow ammonium phosphomolybdate which is soluble in ammonia T.S.

Loss on ignition—Weigh accurately about 1 Gm. of Tribasic Magnesium Phosphate and ignite it to constant weight: it loses not less than 20 per cent and not more than 27 per cent of its weight.

Acid-insoluble substances—If an insoluble residue remains in the test for *carbonate* below, filter the solution, wash well with hot distilled water until the last washing is free from chloride, and ignite the residue: it weighs not more than 4 mg.

Soluble salts—Digest 2 Gm. of Tribasic Magnesium Phosphate with 100 cc. of distilled water for 30 minutes on a steam bath, cool, add sufficient distilled water to restore the original volume, mix well, and filter. Evaporate 50 cc. of the filtrate to dryness, and ignite gently to constant weight: the weight of the residue does not exceed 15 mg.

Carbonate—Mix 2 Gm. of Tribasic Magnesium Phosphate with 20 cc. of distilled water, and add hydrochloric acid, drop by drop, to effect solution: no effervescence occurs when the acid is added.

Chloride—Dissolve 0.5 Gm. of Tribasic Magnesium Phosphate in 50 cc. of diluted nitric acid and add 1 cc. of silver nitrate T.S.: the turbidity, if any, is no greater than that produced by 1 cc. of fiftieth-normal hydrochloric acid, page 626.

Nitrate—Mix 0.2 Gm. of Tribasic Magnesium Phosphate with 5 cc. of distilled water, and add just sufficient hydrochloric acid to effect solution. Dilute with distilled water to 10 cc., add 0.1 cc. of indigo carmine T.S., then add, with stirring, 10 cc. of sulfuric acid: the blue color persists for at least 5 minutes.

Sulfate—Dissolve 0.5 Gm. of Tribasic Magnesium Phosphate in the smallest possible amount of diluted hydrochloric acid, dilute to 48 cc. with distilled water, and add 2 cc. of barium chloride T.S.: the turbidity, if any, is no greater than that produced by 3 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—A 5-cc. portion of a solution of Tribasic Magnesium Phosphate (1 in 25) in diluted nitric acid meets the requirements of the test for *arsenic*, page 554.

Barium—Mix 2 Gm. of Tribasic Magnesium Phosphate with 40 cc. of distilled water, heat, add hydrochloric acid, drop by drop, to effect solution, then add 1 cc. of acid in excess. Cool, dilute with distilled water to 50 cc., and filter. To 5 cc. of the filtrate add 1 cc. of potassium sulfate T.S.: no turbidity appears within 15 minutes.

Calcium—Mix 0.5 Gm. of Tribasic Magnesium Phosphate with 15 cc. of distilled water, heat, and add sufficient hydrochloric acid in small portions to effect solution. Cool, add ammonia T.S. in small portions to produce a permanent slight precipitate, then add 2 cc. of acetic acid. Dilute with distilled water to 25 cc., and filter. To 10 cc. of the filtrate add 2 cc. of ammonium oxalate T.S.: not more than a slight turbidity is produced within 5 minutes.

Heavy metals—Dissolve 1 Gm. of Tribasic Magnesium Phosphate in 4.5 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water. The heavy metals limit, page 586, for Tribasic Magnesium Phosphate is 30 parts per million.

Dibasic salt and magnesium oxide—Ignite about 2.5 Gm. of Tribasic Magnesium Phosphate to constant weight. Weigh accurately about 2 Gm. of the ignited salt, and dissolve it by warming with 50 cc. of normal hydrochloric acid. Cool, add 1 or 2 drops of methyl orange T.S., and slowly titrate the excess of normal hydrochloric acid with normal sodium hydroxide to a yellow color, vigorously shaking the mixture during the titration. Not less than 14.8 cc. and not more than 15.4 cc. of normal hydrochloric acid is consumed for each Gm. of the ignited salt.

Assay—Proceed as directed under *Calcii Phosphas Tribasicus*, page 101, using 0.2 Gm. of the ignited salt, accurately weighed. Each cc. of normal sodium hydroxide corresponds to 0.005717 Gm. of $Mg_3(PO_4)_2$.

Storage—Preserve Tribasic Magnesium Phosphate in well-closed containers.

U. S. P. Product of Tribasic Magnesium Phosphate—Tabellæ Magnesii Phosphatis Tribasici.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

MAGNESII SULFAS

Magnesium Sulfate

Mag. Sulf.—Epsom Salt

 $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

Mol. wt. 246.49

Magnesium Sulfate, when rendered anhydrous by ignition, contains not less than 99.5 per cent of MgSO_4 . It contains not less than 40 per cent and not more than 52 per cent of water.

Description—Magnesium Sulfate occurs as small, colorless crystals, usually needle-like, with a cooling, saline, and bitter taste. It effloresces in warm, dry air.

Solubility—One Gm. of Magnesium Sulfate is soluble in 1 cc. of water and is slowly soluble in about 1 cc. of glycerin, at 25°C . One Gm. of it is soluble in 0.2 cc. of boiling water. It is sparingly soluble in alcohol at 25°C .

Identification—An aqueous solution of Magnesium Sulfate (1 in 20) responds to the tests for magnesium, page 590, and for sulfate, page 592.

Loss on drying—Weigh accurately about 1 Gm. of Magnesium Sulfate in a crucible, heat for an hour or two at about 100°C ., then ignite with a free flame at a dull red heat until the weight is constant: the loss in weight is not less than 40 per cent and not more than 52 per cent.

Reaction—An aqueous solution of Magnesium Sulfate (1 in 20) is neutral to litmus paper.

Chloride—One Gm. of Magnesium Sulfate shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Arsenic—A 5-cc. portion of an aqueous solution of Magnesium Sulfate (1 in 15) meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Dissolve 2 Gm. of Magnesium Sulfate in 10 cc. of distilled water, add 2 cc. of diluted acetic acid, and dilute with distilled water to 25 cc.: the heavy metals limit, page 586, for Magnesium Sulfate is 10 parts per million.

Assay—Weigh accurately about 0.5 Gm. of the ignited Magnesium Sulfate obtained in the test for *loss on drying*, and dissolve it in 100 cc. of distilled water. Gradually add to the solution, with constant stirring, an excess of sodium phosphate T.S. (about 20 cc.). Allow the mixture to stand for 10 minutes, then add 40 cc. of stronger ammonia T.S., and allow to stand for 4 hours. Collect the precipitate on a filter, and wash it with a mixture of 1 volume of ammonia T.S. and 3 volumes of distilled water until free from sulfate. Dry, and ignite the precipitate to constant weight. The weight of the magnesium pyrophosphate ($\text{Mg}_2\text{P}_2\text{O}_7$), multiplied by 1.082, indicates the equivalent weight of MgSO_4 .

Storage—Preserve Magnesium Sulfate in well-closed containers.

AVERAGE DOSE—Metric, 15 Gm.—Apothecaries, 4 drachms.

MAGNESII TRISILICAS

Magnesium Trisilicate

Mag. Trisil.

 $2\text{MgO} \cdot 0.3\text{SiO}_2 \cdot n\text{H}_2\text{O}$

Magnesium Trisilicate is a compound of magnesium oxide and silicon dioxide with varying proportions of water. It contains not less than 20 per cent of magnesium oxide (MgO) and not less than 45 per cent of silicon dioxide (SiO_2).

Description—Magnesium Trisilicate is a fine, white, odorless, tasteless powder, free from grittiness.

Solubility—Magnesium Trisilicate is almost insoluble in water and in alcohol. It is readily decomposed by mineral acids.

Identification—

A: Mix about 0.5 Gm. of Magnesium Trisilicate with 10 cc. of diluted hydrochloric acid, filter, and neutralize the filtrate to litmus paper with ammonia T.S.: the neutralized filtrate responds to the tests for magnesium, page 590.

B: Prepare a bead by fusing a few crystals of sodium ammonium phosphate on a platinum loop in the flame of a Bunsen burner. Place the hot, transparent bead in contact with Magnesium Trisilicate, and again fuse. Silica floats about in the bead, producing, upon cooling, an opaque bead with a web-like structure.

Loss on ignition—Weigh accurately about 1 Gm. of Magnesium Trisilicate in a tared platinum crucible provided with a cover. Gradually apply heat to the crucible at first, then strongly ignite to constant weight: the loss in weight does not exceed 34 per cent.

Soluble salts—Boil 10 Gm. of Magnesium Trisilicate with 150 cc. of distilled water for 15 minutes. Cool to room temperature, and restore to the original volume by adding distilled water. Allow the mixture to stand for 15 minutes, and filter. Dilute 75 cc. of the clear filtrate to 100 cc. with distilled water. Evaporate 50 cc. of this solution to dryness in a tared platinum dish on a water bath, and ignite gently to constant weight: the weight of the residue does not exceed 38.0 mg.

Chloride—Add 0.2 cc. of nitric acid and 1 cc. of silver nitrate T.S. to 20 cc. of the diluted filtrate prepared in the previous test. After 5 minutes the opalescence of the solution does not exceed that of a standard solution prepared at the same time by adding 0.2 cc. of nitric acid, 0.75 cc. of fiftieth-normal hydrochloric acid and 1 cc. of silver nitrate T.S. to 20 cc. of distilled water.

Sulfate—Treat the residue obtained in the test for *soluble salts* with 2 cc. of hydrofluoric acid, and evaporate to dryness on a water bath. Mix the residue with distilled water, transfer to a filter, and wash, using approximately 50 cc. of distilled water for the complete procedure. Heat the filtrate to boiling, and add 0.1 cc. of hydrochloric acid and 5 cc. of barium chloride T.S. Maintain the mixture near its boiling point for 1 hour, filter, wash the precipitate thoroughly with distilled water, dry, and ignite to constant weight: the weight of the residue does not exceed 30.0 mg.

Free alkali—Add 2 drops of phenolphthalein T.S. to 20 cc. of the diluted filtrate prepared in the test for *soluble salts*: not more than 1 cc. of tenth-normal hydrochloric acid is required to render the solution acid to phenolphthalein T.S.

Arsenic—Magnesium Trisilicate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Boil 3 Gm. of Magnesium Trisilicate with 50 cc. of distilled water and 5 cc. of hydrochloric acid for 20 minutes. Add stronger ammonia T.S. until the mixture is only slightly acid to litmus paper. Filter, and wash with from 15 to 20 cc. of distilled water, combining the washings with the original filtrate. Add 2 drops of phenolphthalein T.S. and then a slight excess of ammonia T.S. Discharge the pink color with tenth-normal hydrochloric acid, and then add 8 cc. of tenth-normal hydrochloric acid. Dilute to 75 cc. with distilled water, and use 25 cc. of this solution for the test. The heavy metals limit, page 586, for Magnesium Trisilicate is 30 parts per million.

Adsorptive power—Place 1 Gm. of Magnesium Trisilicate in a suitable glass-stoppered container, and add 75 cc. of an aqueous solution of methylene blue, containing 1 mg. of the dye per cc. Shake the mixture continuously for 5 minutes, and then intermittently during the remainder of a 1-hour period. Allow to settle, and then filter off about 20 cc. through a sintered glass filter crucible or a Gooch crucible with an asbestos mat: the filtrate has no more color than a dilution of 0.2 cc. of the methylene blue solution with sufficient distilled water to make 100 cc.

Acid-consuming capacity—Weigh accurately about 0.2 Gm. of Magnesium Trisilicate into a 125-cc., glass-stoppered Erlenmeyer flask. Add exactly 30 cc. of tenth-

normal hydrochloric acid and exactly 20 cc. of distilled water. Place the flask in a bath maintained at 37° C., and shake the mixture occasionally during a period of 4 hours, but leave the mixture undisturbed during the last 15 minutes of the heating period. Remove the flask from the bath, and withdraw with a pipette exactly 25 cc. of the supernatant liquid. Titrate the excess acid in this 25-cc. portion with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. One Gm. of Magnesium Trisilicate, calculated on the anhydrous basis, consumes not less than 140 cc. and not more than 160 cc. of tenth-normal hydrochloric acid.

Assay for magnesium oxide—Weigh accurately about 1.5 Gm. of Magnesium Trisilicate, and transfer to a 250-cc. Erlenmeyer flask. Add exactly 50 cc. of normal sulfuric acid, and digest on a steam bath for 15 minutes. Cool to room temperature, and titrate the excess acid with normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.02016 Gm. of MgO.

Assay for silicon dioxide—Transfer about 0.7 Gm. of Magnesium Trisilicate, accurately weighed, to a 150-cc. beaker. Add 10 cc. of normal sulfuric acid, and heat on a steam bath for 1 hour and 30 minutes. Treat the residue with 25 cc. of distilled water, and digest on a steam bath for 15 minutes. Decant the supernatant liquid through an ashless filter paper, and wash the residue, with subsequent decantation, three times with hot distilled water. Finally transfer the residue to the filter, and wash thoroughly with hot distilled water. Transfer the filter paper and its contents to a platinum crucible. Heat to dryness, incinerate, ignite strongly for 30 minutes, cool, and weigh. Moisten the residue with distilled water, and add 6 cc. of hydrofluoric acid and 3 drops of sulfuric acid. Evaporate to dryness, ignite for 5 minutes, cool, and weigh: the loss in weight represents the silicon dioxide and is not less than 45 per cent of the weight of the Magnesium Trisilicate taken for the assay.

Ratio of MgO to SiO₂—Divide the percentage of SiO₂ obtained in the *assay for silicon dioxide* by the percentage of MgO obtained in the *assay for magnesium oxide*. The quotient obtained is not less than 2.10 and not more than 2.30.

Storage—Preserve Magnesium Trisilicate in well-closed containers.

U. S. P. Product of Magnesium Trisilicate—Tabellæ Magnesii Trisilicatis.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

MASSA FERRI CARBONATIS

Mass of Ferrous Carbonate

Mass. Ferr. Carb.—Vallet's Mass

Mass of Ferrous Carbonate contains not less than 36 per cent and not more than 41 per cent of FeCO₃.

FERROUS SULFATE.....	100 Gm.
MONOHYDRATED SODIUM CARBONATE.....	46 Gm.
HONEY.....	38 Gm.
SUCROSE.....	25 Gm.
SYRUP,	
DISTILLED WATER, of each, a sufficient quantity,	
To make.....	100 Gm.

Dissolve the ferrous sulfate and monohydrated sodium carbonate, in separate 200-cc. portions of boiling distilled water, and having added 20 cc. of syrup to the solution of the iron salt, filter both solutions, and cool. Place the solution of sodium carbonate in a bottle having a capacity of about 500 cc., and gradually add the solution of the iron salt, rotating the bottle frequently until carbon dioxide no longer escapes. Add sufficient distilled water to fill the bottle, stopper tightly, and set it aside so that the ferrous carbonate may subside. Pour off the supernatant liquid, and having mixed syrup and distilled water in the proportion of 1 volume of syrup to 19 volumes of distilled water, wash the precipitate with the mixture by decantation until the washings no longer have a saline taste. Drain the precipitate on a muslin strainer, and express as much of the water as possible. Then mix the precipitate at once with the honey and sucrose in a tared dish, and by means of a water bath evaporate the mixture, with constant stirring, until its weight is reduced to 100 Gm.

Assay—Dissolve about 1 Gm. of Mass of Ferrous Carbonate, accurately weighed, in 15 cc. of diluted sulfuric acid, dilute the solution with distilled water to 150 cc., and immediately titrate with tenth-normal ceric sulfate, using 0.1 cc. of ortho-phenanthroline T.S. as the indicator. Each cc. of tenth-normal ceric sulfate is equivalent to 0.01159 Gm. of FeCO_3 .

Storage—Preserve Mass of Ferrous Carbonate in tight, light-resistant containers.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

MEL

Honey

Clarified Honey, Strained Honey

Honey is a saccharine secretion deposited in the honeycomb by the bee, *Apis mellifera* Linné (Fam. *Apidae*). It must be free from foreign substances such as parts of insects, leaves, etc., but may contain pollen grains.

Description—Honey is a thick, syrupy liquid of a light yellowish or yellowish brown color. It is translucent when fresh, but frequently becomes opaque and granular through crystallization of dextrose. It has a characteristic odor and a sweet, faintly acid taste. Honey is laevorotatory at 20° C.

Specific gravity—When Honey is diluted with twice its weight of distilled water, the mixture is only moderately turbid, is not stringy, and has a specific gravity of not less than 1.099 at 25° C.

Ash—Weigh accurately about 10 Gm. of Honey into a platinum dish, add a few drops of olive oil to prevent spattering, heat carefully until swelling ceases, and ignite at not above dull redness until a white ash is obtained: not more than 0.3 per cent of ash remains.

Reaction—Honey is slightly acid to litmus paper.

Chloride—A 10-cc. portion of a filtered aqueous solution of Honey (1 in 10) shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 10-cc. portion of a filtered aqueous solution of Honey (1 in 10) shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Artificial honey—Triturate about 1 Gm. of Honey with 20 cc. of ether in a mortar, filter into a porcelain dish or crucible, allow the ether to evaporate, and add to the residue 1 drop of freshly prepared resorcinol T.S.: at most the mixture has only a pink color which disappears in 30 seconds, but not an orange, cherry, or brown red color.

Foreign coloring matter—An aqueous solution of Honey (1 in 2) does not immediately change its color when mixed with an equal volume of ammonia T.S.

Azo dyes—To 5 cc. of an aqueous solution of Honey (1 in 2) add a few drops of hydrochloric acid: a red or rose color is not produced immediately.

Starch or dextrins—Boil about 2 Gm. of Honey with 20 cc. of distilled water, cool, and add 2 drops of iodine T.S.: the liquid is not blue, green, or reddish in color.

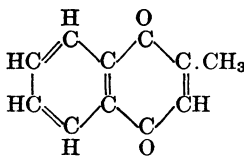
Free acid—A solution of 10 Gm. of Honey in 50 cc. of distilled water requires not more than 0.5 cc. of normal sodium hydroxide for neutralization, phenolphthalein T.S. being used as the indicator.

Storage—Preserve Honey in well-closed containers.

MENADIONUM

Menadione

Menadion.—2-Methyl-Naphthoquinone



$C_{11}H_8O_2$

Mol. wt. 172.17

Menadione, when dried over sulfuric acid in a vacuum desiccator for 4 hours, contains not less than 98.5 per cent of $C_{11}H_8O_2$.

Caution—*Menadione powder is irritating to the respiratory tract and to the skin, and an alcoholic solution has vesicant properties.*

Description—Menadione occurs as a bright yellow, crystalline powder, and is nearly odorless. It is affected by sunlight.

Solubility—Menadione is practically insoluble in water. One Gm. dissolves in about 60 cc. of alcohol, and in about 10 cc. of benzene, at 25° C. It is moderately soluble in chloroform and in carbon tetrachloride, and is soluble in vegetable oils.

Melting point—Menadione melts between 105° and 107° C., page 595.

Identification—To 50 mg. of Menadione add 5 cc. of distilled water, then add 75 mg. of sodium bisulfite, and heat on a steam bath, shaking vigorously until the substance is dissolved and the solution is almost colorless. Add sufficient distilled water to make 50 cc., and mix well. To 2 cc. of the solution add 2 cc. of alcoholic ammonia (prepared by mixing equal volumes of alcohol and of strong solution of ammonia), shake, and add 3 drops of ethyl cyanoacetate: a deep purplish blue color is produced which, on the addition of 1 cc. of sodium hydroxide solution (1 in 3), changes to green and then to yellow.

Ash—Menadione yields not more than 0.1 per cent of ash, page 556.

Loss on drying—When dried in a vacuum desiccator over sulfuric acid for 4 hours, Menadione loses not more than 0.3 per cent of its weight.

Assay—Weigh accurately about 0.15 Gm. of Menadione, previously dried over sulfuric acid in a vacuum desiccator for 4 hours in the dark, and transfer it completely to a 150-cc. flask. Add 15 cc. of glacial acetic acid and 15 cc. of diluted hydrochloric acid, and rotate the flask until the Menadione is dissolved. Then add about 1 Gm. of zinc dust, close the flask with a stopper bearing a Bunsen valve, and allow to stand in the dark for 30 minutes, with occasional shaking. Rapidly decant the solution through a pledget of cotton into another flask, immediately wash the reduction flask with three 10-cc. portions of freshly boiled and cooled distilled water, and at once titrate the combined filtrate and washings with tenth-normal ceric sulfate, using 0.1 cc. of orthophenanthroline T.S. as the indicator. Perform a blank test with the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal ceric sulfate is equivalent to 0.008609 Gm. of $C_{11}H_8O_2$.

Storage—Preserve Menadione in well-closed, light-resistant containers.

U. S. P. Product of Menadione—Tabellæ Menadioni.

AVERAGE DOSE—Metric, 1 mg.—Apothecaries, $\frac{1}{60}$ grain.

MENTHA PIPERITA

Peppermint

Menth. Pip.

Peppermint consists of the dried leaf and flowering top of *Mentha piperita* Linné (Fam. *Labiata*).

Peppermint contains not more than 2 per cent of stems over 3 mm. in diameter, or other foreign organic matter, page 628.

Description—

Unground Peppermint—Leaves opposite, more or less crumpled and frequently detached from the stem; petiole from 4 to 15 mm. in length, slightly pubescent, blade ovate-oblong to oblong-lanceolate, from 1 to 9 cm. in length, apex acute, base narrowed or rounded, margin sharply serrate; light green to purplish brown; upper surface nearly glabrous, lower surface with a few hairs on the veins and many amber-colored glandular hairs; stem quadrangular, from 1 to 3 mm. in diameter, glabrous except for a few scattered deflexed hairs, green to dark purple; verticillasters usually in a compact, oblong or oval spike, from 1 to 1.5 cm. in breadth, rounded at the summit, and in fruit attaining a length of from 3 to 7 cm.; bracts oblong-lanceolate from 4 to 7 mm. in length; calyx tubular-campanulate, equally 5-toothed, pubescent, and glandular-punctate, green to

dark purple; corolla glabrous, light purple, tubular-campanulate, 4-cleft, about 3 mm. in length; stamens 4, short and equal; style 2- or 3-cleft at the summit; nutlets ellipsoidal, about 500 microns in diameter; odor aromatic, characteristic, taste pungent, followed by a cooling sensation in the mouth.

Powdered Peppermint—Green to light olive green, fragments of leaf epidermis with wavy vertical walls and, if from the lower surface of the leaf, with numerous stomata and glandular and non-glandular hairs, the latter especially numerous along the veins; glandular hairs with a 1- to 2-celled stalk and 1- to 8-celled head, usually set in a depression in the leaf and containing volatile oil and frequently yellowish or brownish crystals which refract polarized light; non-glandular hairs with thin, papillose walls and frequently with short, longitudinal striations, 1 to 8 cells long, the terminal cell pointed or sometimes globular; fragments of chlorenchyma with vascular tissue, the tracheæ spiral or with simple pores and but slightly lignified; fragments of collenchyma and of thin-walled, non-lignified fibers associated with parenchyma; pollen grains spheroidal and smooth.

U. S. P. Products of Peppermint—Aqua Menthæ Piperitæ, Oleum Menthæ Piperitæ, Spiritus Menthæ Piperitæ.

MENTHA VIRIDIS

Spearmint

Menth. Vir.

Spearmint consists of the dried leaf and flowering top of *Mentha spicata* Linné (*Mentha Viridis* Linné) (Fam. Labiatæ).

Spearmint contains not more than 2 per cent of stems over 3 mm. in diameter, or other foreign organic matter, page 628.

Description—

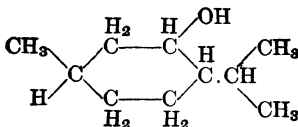
Unground Spearmint—Leaves more or less crumpled, opposite, blade ovate-lanceolate, 3 to 7 cm. in length, apex acute or acuminate, base narrowed or rounded, margin unequally serrate, bright green in color, upper surface nearly glabrous, under surface with a few hairs on the veins and many amber-colored glandular hairs, nearly sessile or with a petiole less than 12 mm. in length; stems oppositely branched, quadrangular, 1 to 3 mm. in diameter, ridged, nearly glabrous and green, dusky red or purplish; verticillasters in opposite clusters and in more or less interrupted or crowded, lanceolate, nearly acute spikes, 3 to 7 mm. in diameter, and in fruit becoming 9 cm. in length; bracts linear-lanceolate, subulate, ciliate, 7 to 10 mm. in length, some of them longer than the flowers, subtending the flower clusters; calyx campanulate, equally 5-toothed, glandular-punctate, pubescent on teeth, green to purplish red; corolla glabrous, nearly white or from moderate yellowish brown to weak yellowish orange, tubular-campanulate, its tube shorter than the calyx, its limb 4-cleft; stamens 4, equal; style 2-cleft at the summit; nutlets ellipsoidal, smooth, about 500 microns in diameter; odor slightly pungent, aromatic, characteristic; taste characteristic, but not followed by a cooling sensation in the mouth.

Powdered Spearmint—Green to olive green; closely resembling the powder of peppermint except for the absence of crystals from the globular heads of the glandular hairs and for the non-glandular hairs which are usually up to 6-celled.

U. S. P. Products of Spearmint—Aqua Menthæ Viridis, Oleum Menthæ Viridis, Spiritus Menthæ Viridis.

MENTHOL

Menthol

 $C_{10}H_{20}O$

Mol. wt. 156.26

Menthol is an alcohol obtained from oil of peppermint or other mint oils, or prepared synthetically.

Description—Menthol occurs as colorless, hexagonal crystals, usually needle-like, or in fused masses, or as a crystalline powder, having a peppermint-like odor.

Solubility—Menthol is slightly soluble in water. It is very soluble in alcohol, in chloroform, in ether, and in petroleum benzin. It is freely soluble in glacial acetic acid, in liquid petrolatum, and in fixed and volatile oils.

Melting point—Menthol melts between 41° and 43° C., page 595.

Identification—

A: When Menthol is triturated with about an equal weight of camphor, chloral hydrate, phenol, or thymol, the mixture liquefies.

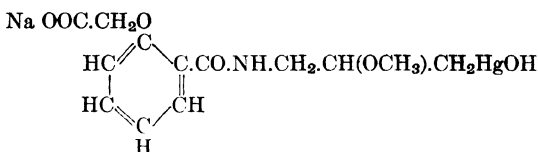
B: An alcoholic solution of Menthol is levorotatory, page 601.

Wax, paraffin or inorganic substances—Heat 2 Gm. of Menthol in an open dish on a water bath: it gradually volatilizes, leaving not more than 0.05 per cent of residue.

Storage—Preserve Menthol in tight containers, preferably at a temperature not above 30° C.

MERSALYL

Mersalyl

 $C_{13}H_{16}HgNO_6Na$

Mol. wt. 505.87

Mersalyl, when dried over sulfuric acid for 24 hours, contains not less than 38.5 per cent and not more than 40.5 per cent of mercury (Hg).

Description—Mersalyl occurs as a white or almost white, crystalline powder. It is odorless, and has a bitter taste. Mersalyl is somewhat deliquescent, and is gradually decomposed by light.

Solubility—One Gm. of Mersalyl dissolves in about 1 cc. of water, and in about 2 cc. of alcohol at 25° C. It is insoluble in chloroform and in ether.

Identification—

A: Dissolve about 0.5 Gm. of Mersalyl in 5 cc. of distilled water, add 5 cc. of formic acid, and boil the mixture under a reflux condenser for 15 minutes: a gray precipitate of metallic mercury is formed. Decant the hot solution through a small filter paper, allow the filtrate to cool, collect the separated crystals of salicylalylamido-O-acetic acid on a small filter, wash them four times with 5-cc. portions of cold distilled water, allow to drain, and dry the crystals over sulfuric acid in a vacuum desiccator for 24 hours: the crystals melt between 119° and 122° C.

B: The precipitate of metallic mercury obtained in *identification test A*, when dissolved in a few drops of hot nitric acid, responds to the reactions for mercury, page 591.

Loss on drying—When dried over sulfuric acid for 24 hours, Mersalyl loses not more than 7 per cent of its weight.

Reaction—An aqueous solution of Mersalyl (1 in 10) is alkaline to litmus paper.

Chloride—Dissolve 0.1 Gm. of Mersalyl in 5 cc. of distilled water, add 2 drops of nitric acid, and filter through a small filter paper: the filtrate does not become opalescent immediately upon the addition of 2 drops of silver nitrate T.S.

Sulfate—Dissolve 0.1 Gm. of Mersalyl in 5 cc. of distilled water, add 2 drops of hydrochloric acid, and filter through a small filter paper: the filtrate does not become turbid immediately upon the addition of 2 drops of barium chloride T.S.

Mercuric ions—Dissolve 0.5 Gm. of Mersalyl in 10 cc. of distilled water, and add 2 drops of sodium sulfide T.S.: no color is produced immediately.

Readily oxidizable substances—Dissolve 0.5 Gm. of Mersalyl in 10 cc. of distilled water, add 1 cc. of diluted sulfuric acid, filter through a small filter paper, and add 0.05 cc. of tenth-normal potassium permanganate to the filtrate: the mixture does not become decolorized immediately.

Assay for mercury—Place about 0.4 Gm. of Mersalyl, accurately weighed, in a Kjeldahl flask, add 10 cc. of sulfuric acid, insert a small, short-stemmed funnel into the neck of the flask, then add 10 cc. of nitric acid. Heat the mixture gently until frothing ceases, and then more strongly until the solution is colorless or nearly so. Add more nitric acid during the digestion if necessary, and keep the funnel in the neck of the flask during digestion. Allow the solution to cool, and cautiously add through the funnel about 50 cc. of cold distilled water. Rinse the funnel and the neck of the flask with a few cc. of distilled water, receiving the rinsings in the flask. Add potassium permanganate T.S. dropwise to the warm solution until a pink color persists, and discharge the pink color with the aid of just sufficient oxalic acid T.S., added dropwise. Cool the solution, add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

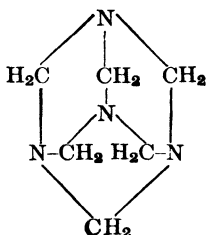
Storage—Preserve Mersalyl in tight, light-resistant containers.

U. S. P. Product of Mersalyl—Injectio Mersalyilis et Theophyllinæ.

METHENAMINA

Methenamine

Methenam.—Hexamethylenamine, Hexamethylenetetramine



$C_6H_{12}N_4$

Mol. wt. 140.19

Methenamine, when dried over sulfuric acid for 4 hours, contains not less than 99 per cent of $(CH_2)_6N_4$.

Description—Methenamine occurs as colorless, lustrous crystals, or as a white, crystalline powder. It is practically odorless. When brought into contact with fire, it readily ignites, burning with a smokeless flame. It sublimates at about 260° C. without melting.

Solubility—One Gm. of Methenamine dissolves in 1.5 cc. of water, in 12.5 cc. of alcohol, and in about 10 cc. of chloroform, at 25° C.

Identification—Heat an aqueous solution of Methenamine (1 in 10) with diluted sulfuric acid: it decomposes with the liberation of formaldehyde, which is recognized by its odor or by its effect on paper moistened with silver ammonium nitrate T.S. On the subsequent addition of an excess of solution of sodium hydroxide, ammonia is evolved.

Loss on drying—When dried over sulfuric acid for 4 hours, Methenamine loses not more than 2 per cent of its weight.

Ash—Methenamine yields not more than 0.05 per cent of ash, page 556.

Reaction—An aqueous solution of Methenamine is alkaline to litmus paper.

Chloride—One Gm. of Methenamine shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—The addition of 5 drops of barium chloride T.S. to 10 cc. of an aqueous solution of Methenamine (1 in 50), acidulated with 5 drops of hydrochloric acid, produces no turbidity within 1 minute.

Ammonium salts—Add 1 cc. of alkaline mercuric potassium iodide T.S. to 10 cc. of an aqueous solution of Methenamine (1 in 20): the mixture is not darker in color than a mixture of 1 cc. of the reagent and 10 cc. of distilled water.

Heavy metals—Dissolve 2 Gm. of Methenamine in 10 cc. of distilled water, add 2 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Methenamine is 10 parts per million.

Assay—Weigh accurately about 1 Gm. of Methenamine, previously dried over sulfuric acid for 4 hours, place it in a beaker, add 40 cc. of normal sulfuric acid, and boil gently, adding a little distilled water from time to time, if necessary, until the odor of formaldehyde is no longer perceptible. Cool, add 20 cc. of distilled water, and titrate the excess of acid with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.03505 Gm. of $(\text{CH}_2)_6\text{N}_4$.

Storage—Preserve Methenamine in well-closed containers.

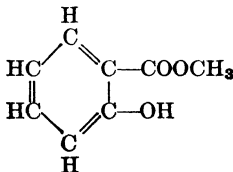
U. S. P. Product of Methenamine—Tabellæ Methenaminæ.

AVERAGE DOSE—Metric, 0.5 Gm.—Apothecaries, $7\frac{1}{2}$ grains.

METHYLIS SALICYLAS

Methyl Salicylate

Methyl. Salicyl.—Oil of Gaultheria, Oil of Wintergreen, Oil of Betula, Oil of Sweet Birch



$\text{C}_8\text{H}_8\text{O}_2$

Mol. wt. 152.14

Methyl Salicylate is produced synthetically or is obtained by maceration and subsequent distillation with steam from the leaves of *Gaultheria*

procumbens Linné (Fam. *Ericaceæ*) or from the bark of *Betula lenta* Linné (Fam. *Betulaceæ*). It contains not less than 98 per cent of $C_6H_4(OH)CO_2CH_3$.

Methyl Salicylate must be labeled to indicate whether it was made synthetically or distilled from either of the plants mentioned above.

Description—Methyl Salicylate is a colorless, yellowish, or reddish liquid, having the characteristic odor and taste of gaultheria.

Solubility—Methyl Salicylate is slightly soluble in water, is soluble in alcohol and in glacial acetic acid. It is soluble in about 7 volumes of 70 per cent alcohol at $25^\circ C.$, the solution having not more than a slight cloudiness.

Specific gravity—The specific gravity of Methyl Salicylate at $25^\circ C.$ is not less than 1.180 and not more than 1.185 for the synthetic variety, and not less than 1.176 and not more than 1.182 for that prepared from gaultheria or from betula.

Boiling range—The boiling range of Methyl Salicylate is between 219° and $224^\circ C.$, page 559.

Optical rotation—Synthetic Methyl Salicylate and that from betula are optically inactive. The optical rotation of Methyl Salicylate from gaultheria does not exceed -1.5° in a 100-mm. tube at $25^\circ C.$, page 601.

Refractive index—The refractive index of Methyl Salicylate is not less than 1.5350 and not more than 1.5380 at $20^\circ C.$, page 608.

Identification—Shake 1 drop of Methyl Salicylate with about 5 cc. of distilled water, and add 1 drop of ferric chloride T.S.: the resulting mixture has a deep violet color.

Reaction—A solution of 1 volume of Methyl Salicylate in 2 volumes of alcohol is neutral or slightly acid to moistened litmus paper.

Heavy metals—Methyl Salicylate meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Limit of free acid—A 5-cc. portion of Methyl Salicylate, when shaken with 25 cc. of freshly boiled and cooled distilled water, requires not more than 0.45 cc. of tenth-normal sodium hydroxide for neutralization, phenol red T.S. being used as the indicator.

Assay—Place about 2 cc. of Methyl Salicylate, accurately weighed, in a tared flask, add 50 cc. of half-normal alcoholic potassium hydroxide, connect the flask with a reflux condenser, and heat the mixture on a water bath for 2 hours. Add a few drops of phenolphthalein T.S., and titrate the excess of alkali with half-normal hydrochloric acid. Each cc. of half-normal alcoholic potassium hydroxide corresponds to 0.07607 Gm. of $C_6H_4(OH)CO_2CH_3$.

Storage—Preserve Methyl Salicylate in tight containers.

METHYLROSANILINÆ CHLORIDUM

Methylrosaniline Chloride

Methylrosanil. Chlorid.—Gentian Violet, Methyl Violet, Crystal Violet

Methylrosaniline Chloride is hexamethylpararosaniline chloride, usually admixed with pentamethylpararosaniline chloride and tetramethylpararosaniline chloride.

Description—Methylosaniline Chloride occurs as a dark green powder or greenish glistening pieces having a metallic luster, with not more than a faint odor.

Solubility—One Gm. of Methylosaniline Chloride dissolves in from 30 cc. to 40 cc. of water, in about 10 cc. of alcohol, and in about 15 cc. of glycerin, at 25° C. It is soluble in chloroform, but insoluble in ether.

Identification—

- A: Sprinkle about 1 mg. of Methylosaniline Chloride on 1 cc. of sulfuric acid: it dissolves in the acid with an orange or brown red color. When this solution is diluted cautiously with distilled water, the color changes to brown, then to green, and finally to blue.
- B: Dissolve about 20 mg. of Methylosaniline Chloride in 10 cc. of distilled water and add 5 drops of hydrochloric acid. To 5 cc. of this solution add tannic acid T.S. drop by drop: a deep blue precipitate is produced.
- C: To the remainder of the solution prepared for *test B* add about 0.5 Gm. of zinc dust, and warm the mixture: rapid decolorization occurs. Place a drop of the decolorized solution adjacent to a drop of ammonia T.S. on a filter paper: the zone of contact assumes a blue color.

Loss on drying—When dried to constant weight at 110° C., Methylosaniline Chloride loses not more than 7.5 per cent of its weight.

Ash—Methylosaniline Chloride yields not more than 1.5 per cent of ash, page 556.

Arsenic—Intimately mix 0.2 Gm. of Methylosaniline Chloride with about 0.5 Gm. each of powdered potassium nitrate and anhydrous sodium carbonate, and heat the mixture in a crucible until the organic matter is completely oxidized. Dissolve the cooled residue in 15 cc. of diluted sulfuric acid, and evaporate the solution over a flame until vapors of sulfuric acid begin to evolve: the residue so obtained meets the requirements of the test for *arsenic*, page 554.

Lead—Place 2 Gm. of Methylosaniline Chloride in a tall 250-cc. beaker, cover with a watch glass, and add 10 cc. of sulfuric acid. Digest the mixture until the Methylosaniline Chloride is thoroughly charred. Then through the lip, add cautiously, in 1-cc. portions, 10 cc. of nitric acid. After the reaction is over, heat gently until the rapid evolution of brown fumes ceases. Then continue heating, adding at intervals 1-cc. portions of nitric acid until the organic matter is destroyed and the solution is colorless or a pale yellow. Continue the heating until a 2-cc. portion of the solution remains in the beaker, cool, cautiously add 10 cc. of distilled water, and continue to evaporate until strong white fumes of sulfur trioxide appear. Cool, add 40 cc. of distilled water and 50 cc. of alcohol, and allow to stand over night. Even if no precipitate of lead sulfate is visible, filter, and wash with 50 cc. of diluted alcohol, using for the filtration two small retentive filter papers placed one within the other. Place the filter papers in a small beaker, add 20 cc. of a solution of ammonium acetate, made by cautiously adding stronger ammonia T.S. to 100 cc. of acetic acid until the solution is practically neutral to litmus paper, and heat to boiling, breaking up the filter paper with a glass rod. Filter through a small filter paper or through a sintered glass crucible into a 50-cc. volumetric flask, wash with a dilution (1 in 10) of the ammonium acetate solution until the 50-cc. mark is reached, and mix well. Transfer 25 cc. of the solution to a Nessler tube and add 10 cc. of hydrogen sulfide T.S. Any dark color is not more intense than that produced by a comparison solution made with the same reagents and in the same manner and to which a 2-cc. portion of standard lead solution, page 586, has been added.

Dextrin—Boil 1 Gm. of Methylosaniline Chloride, accurately weighed, with 50 cc. of alcohol under a reflux condenser for 15 minutes, filter through a tared filtering crucible, wash the residue on the filter with hot alcohol until the washings cease to be colored violet, and dry the crucible to constant weight at 100° C.: the insoluble residue amounts to not more than 1 per cent.

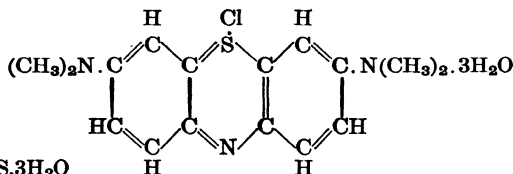
Storage—Preserve Methylosaniline Chloride in well-closed containers.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

METHYLTHIONINÆ CHLORIDUM

Methylthionine Chloride

Methylthionin. Chlorid.—Methylene Blue

 $C_{16}H_{18}ClN_3S \cdot 3H_2O$

Mol. wt. 373.89

Methylthionine Chloride contains not less than 98.5 per cent of $C_{16}H_{18}ClN_3S$, calculated on a dry basis, the loss on drying being determined on a separate portion by drying at $110^\circ C.$ for 18 hours.

Description—Methylthionine Chloride occurs as dark green, odorless crystals or as a crystalline powder, having a bronze-like luster. It is stable in air. Solutions of Methylthionine Chloride have a deep blue color.

Solubility—One Gm. of Methylthionine Chloride dissolves in about 25 cc. of water and in about 65 cc. of alcohol, at $25^\circ C.$ It is soluble in chloroform.

Identification—

- A: The addition of hydrochloric acid to an aqueous solution of Methylthionine Chloride changes the color to a lighter shade of blue.
- B: The addition of sodium hydroxide T.S. to an aqueous solution of Methylthionine Chloride changes the color to a purplish shade, and if added in excess, produces, on standing, a precipitate having a dull violet color.
- C: A solution of Methylthionine Chloride in diluted sulfuric acid is gradually decolorized upon the addition of zinc dust.

Loss on drying—When dried for 18 hours, at $110^\circ C.$, Methylthionine Chloride loses not more than 18 per cent of its weight.

Ash—Methylthionine Chloride yields not more than 1.2 per cent of ash, page 556.

Arsenic—Intimately mix 0.2 Gm. of Methylthionine Chloride with about 0.5 Gm. each of powdered potassium nitrate and anhydrous sodium carbonate, and heat the mixture in a crucible until the organic matter is completely oxidized. Dissolve the cooled residue in 15 cc. of diluted sulfuric acid, and evaporate the solution over a flame until the vapors of sulfuric acid begin to evolve: the residue so obtained meets the requirements of the test for *arsenic*, page 554.

Copper or zinc—Heat 1.0 Gm. of Methylthionine Chloride until it is thoroughly carbonized. Powder the residue and boil it with 15 cc. of diluted nitric acid for 5 minutes, then filter, and wash the residue with 10 cc. of distilled water. Boil the combined filtrate and washings with 1 cc. of nitric acid, add an excess of ammonia T.S., and filter through a small filter paper. Then add to the filtrate 10 cc. of hydrogen sulfide T.S.: no turbidity is produced in 5 minutes (*zinc*); any dark color produced is not darker than that produced by treating a quantity of reagent cupric sulfate, equivalent to 0.1 mg. of copper (Cu), in the same manner as the sample, beginning with "and boil it with 15 cc. of diluted nitric acid."

Assay—Place about 0.1 Gm. of Methylthionine Chloride, accurately weighed, in a 250-cc. beaker, dissolve, with stirring, in 70 cc. of distilled water at a temperature of $70^\circ C.$, and allow the solution to cool. Add 30 cc. of a saturated aqueous solution of potassium perchlorate, and stir the mixture intermittently for 10 minutes. Filter the mixture through asbestos in a perforated crucible that has been dried at $110^\circ C.$ and weighed. With the aid of a rubber-tipped glass rod transfer the precipitate remaining in the beaker to the crucible, using 50 cc. of methylthionine perchlorate T.S. Wash the precipitate and crucible with an additional 50 cc. of this solution, dry the crucible and precipitate for 1 hour at $110^\circ C.$, and weigh.

The weight of the precipitate, multiplied by 0.8333, corresponds to not less than 98.5 per cent of the Methylthionine Chloride taken, calculated on a dry basis.
Storage—Preserve Methylthionine Chloride in well-closed containers.

AVERAGE DOSE—Metric, 0.15 Gm.—Apothecaries, $2\frac{1}{2}$ grains.

MISTURA CRETÆ

Chalk Mixture

Mist. Cret.

PREPARED CHALK.....	6	Gm.
SACCHARIN SODIUM.....	0.03	Gm.
BENTONITE.....	2.5	Gm.
CINNAMON WATER.....	40	cc.
DISTILLED WATER, a sufficient quantity,		
To make.....	100	cc.

Sprinkle the bentonite upon 50 cc. of hot distilled water, a little at a time, until all of the bentonite has been wetted. Allow to stand with occasional stirring for about 10 hours, or until a uniform magma results. Dilute with the cinnamon water, and add this mixture gradually and with active trituration, to the prepared chalk and the saccharin sodium in a mortar. Finally add sufficient distilled water to make the finished product measure 100 cc.

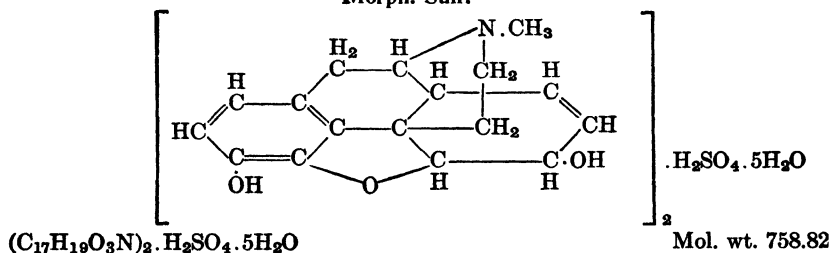
NOTE—If the bentonite is added to the distilled water and stirred with an electric mixer to a uniform magma, the time required to produce a magma will be reduced. After a uniform magma has been produced by the use of a mixer, add the cinnamon water, and set the mixture aside for 30 minutes. Then proceed as directed above.

AVERAGE DOSE—Metric, 15 cc.—Apothecaries, 4 fluidrachms.

MORPHINÆ SULFAS

Morphine Sulfate

Morph. Sulf.



Description—Morphine Sulfate occurs as white, feathery, silky crystals, as cubical masses of crystals, or as a white, crystalline powder. It is odorless and when exposed to air gradually loses water of hydration. It is affected by light.

Solubility—One Gm. of Morphine Sulfate dissolves in 16 cc. of water and in 570 cc. of alcohol, at 25° C. One Gm. dissolves in 1 cc. of water at 80° C. and in about 240 cc. of alcohol at 60° C. It is insoluble in chloroform and in ether.

Identification—

- A: Add a few drops of ammonia T.S. to 5 cc. of an aqueous solution of Morphine Sulfate (1 in 30), and gently shake the mixture: a white precipitate is formed, which dissolves upon the subsequent addition of a few cc. of sodium hydroxide T.S.
- B: Sulfuric acid, containing 5 mg. of selenous acid in each cc., gives with Morphine Sulfate a blue color, changing to green and then to brown (*codeine* yields a green color, changing to blue and afterwards to grass green).
- C: Sulfuric acid, containing 5 mg. of molybdic acid in each cc., gives with Morphine Sulfate a purple color, changing to blue.
- D: Sulfuric acid, containing in each cc. one drop of formaldehyde T.S., yields an intensely purple color with Morphine Sulfate.
- E: Add potassium ferricyanide T.S., containing 1 drop of ferric chloride T.S. in each cc., to an aqueous solution of Morphine Sulfate (1 in 100): a deep blue color is produced at once (difference from *codeine*).
- F: An aqueous solution of Morphine Sulfate responds to the tests for sulfate, page 592.

Loss on drying—When dried at 130° C. for 4 hours Morphine Sulfate loses not more than 12 per cent of its weight.

Ash—The ash from 0.5 Gm. of Morphine Sulfate is negligible, page 556.

Free acid—A solution of 0.5 Gm. of Morphine Sulfate in 15 cc. of distilled water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Meconate—Add a few drops of ferric chloride T.S. to 5 cc. of an aqueous solution of Morphine Sulfate (1 in 30), previously mixed with 5 cc. of diluted hydrochloric acid: no red color is produced.

Ammonium salts—Warm 0.2 Gm. of Morphine Sulfate with 5 cc. of sodium hydroxide T.S.: the mixture does not evolve a noticeable odor of ammonia.

Foreign alkaloids—Dissolve 1.00 Gm. of Morphine Sulfate in 10 cc. of sodium hydroxide T.S. in a separator, and shake the solution with three successive portions of 15, 10, and 10 cc. of chloroform, passing the chloroform solutions through a small filter previously moistened with chloroform. Shake the combined chloroform solutions with 5 cc. of distilled water, separate the chloroform, and evaporate it carefully to dryness on a water bath. Add to the residue thus obtained 10 cc. of fiftieth-normal sulfuric acid, heat gently until dissolved, cool, add 2 drops of methyl red T.S., and titrate the excess of acid with fiftieth-normal sodium hydroxide: not less than 7.5 cc. of the sodium hydroxide solution is required.

Storage—Preserve Morphine Sulfate in tight, light-resistant containers.

U. S. P. Product of Morphine Sulfate—*Tabellæ Morphinæ Sulfatis*.

AVERAGE DOSE—Metric, 10 mg.—Apothecaries, $\frac{1}{6}$ grain.

MUCILAGO ACACIÆ

Mucilage of Acacia

Mucil. Acac.—Mucilage of Gum Arabic

ACACIA, in small fragments.....	350 Gm.
BENZOIC ACID.....	2 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Place the acacia in a graduated bottle having a wide mouth and a capacity not exceeding 1000 cc., wash the drug with cold distilled water, allow it to drain, and add enough warm distilled water, in which the benzoic acid has been dissolved, to make the product measure 1000 cc. After stoppering, lay the bottle on its side, rotating it occasionally, and when the acacia has dissolved, strain the mucilage.

Mucilage of Acacia may also be prepared by adding 400 cc. of distilled water, in which the benzoic acid has previously been dissolved with the aid of heat, to 350 Gm. of powdered or granular acacia, in a mortar, and triturating until the acacia is dissolved. Then add sufficient distilled water to make the product measure 1000 cc.

Caution—Mucilage of Acacia must be free from mold or any other indication of decomposition.

Storage—Preserve Mucilage of Acacia in well-closed containers.

AVERAGE DOSE—Metric, 15 cc.—Apothecaries, 4 fluidrachms.

MUCILAGO TRAGACANTHÆ

Mucilage of Tragacanth

Mucil. Trag.

TRAGACANTH.....	6 Gm.
BENZOIC ACID.....	0.2 Gm.
GLYCERIN.....	18 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	100 Gm.

Mix the glycerin with 75 cc. of distilled water in a tared vessel, heat the mixture to boiling, discontinue the application of heat, add the tragacanth and the benzoic acid, and macerate the mixture during 24 hours, stirring occasionally. Then add enough distilled water to make the mixture weigh 100 Gm., stir actively until of uniform consistence, and strain forcibly through muslin.

Storage—Preserve Mucilage of Tragacanth in well-closed containers.

MYRISTICA

Myristica

Myrist.—Nutmeg

Myristica is the dried ripe seed of *Myristica fragrans* Houttuyn (Fam. *Myristicaceæ*), deprived of its seed-coat and arillode and with or without

Myristica yields not less than 25 per cent of non-volatile, ether-soluble extractive. It yields not more than 0.5 per cent of acid-insoluble ash, page 629.

Description—

Unground Myristica—Ovoid or ellipsoidal, from 20 to 30 mm. in length and about 20 mm. in thickness; externally light brown to dark brown; reticulately furrowed, the broad end with a large, circular, upraised scar from which arises a raphe extending to a depression at the opposite end; the cut surface having a waxy luster and a mottled appearance, given by the dark perisperm and the lighter colored endosperm; odor characteristically aromatic, taste pungently aromatic.

Histology—Perisperm thin, reddish brown to yellowish orange, penetrating by many wavy branches or folds into the yellowish brown endosperm and forming with it ruminant albumen; embryo small and more or less shrunken, in an irregular cavity near the base.

Powdered Myristica—Brown to moderate yellowish brown; consisting of irregular fragments; perisperm with large, circular or elliptical volatile-oil reservoirs, small thin-walled parenchyma cells with reddish orange to orange or brown contents and occasional spiral tracheæ; endosperm with more or less polygonal parenchyma cells containing starch, large aleurone grains, fat, and occasionally brown to yellowish orange pigment; fixed oil globules numerous; starch grains single or 2- to 3-compound, or in aggregates, the individual grains, spherical, planoconvex or polygonal, from 3 to 22 microns in diameter, with a distinct, sometimes cleft hilum.

Assay—Proceed as directed under *non-volatile, ether-soluble extractive*, page 631.

U. S. P. Product of *Myristica*—*Oleum Myristicæ*.

MYRRHA

Myrrh

Myrrh.—Gum Myrrh

Myrrh is an oleo-gum-resin obtained from *Commiphora molmol* Engler, *Commiphora abyssinica* (Berg) Engler or from other species of *Commiphora* (Fam. *Burseraceæ*).

Myrrh yields not less than 30 per cent of alcohol-soluble extractive. It yields not more than 5 per cent of acid-insoluble ash, page 629.

Description—

Unground Myrrh—Rounded or irregular tears or masses of agglutinated tears, moderate yellow to dark or reddish brown and more or less covered with a lighter colored yellowish dust; fracture waxy, granular, conchoidal; internally yellowish or reddish brown, sometimes marked with nearly white spots or lines, oily, translucent at the edges; odor balsamic, aromatic, not terebinthinate; taste aromatic, bitter, and acrid.

Powdered Myrrh—Weak yellowish orange to strong yellowish brown; consisting of numerous angular fragments of resin and gum, a few fragments of lignified tissue and a very few starch grains.

Identification—

A: Myrrh becomes purplish to violet when treated with nitric acid.

B: An ether solution of Myrrh becomes reddish violet when treated with bromine vapor.

C: When triturated with water, Myrrh forms a yellowish brown emulsion.

Assay—Proceed as directed under *alcohol-soluble extractive*, page 631.

U. S. P. Product of Myrrh—*Tinctura Myrrhæ*.

NEBULA EPINEPHRINÆ HYDROCHLORIDI

Epinephrine Hydrochloride Spray

Nebul. Epineph. Hydrochlor.—Solution of Epinephrine Hydrochloride 1:100

Epinephrine Hydrochloride Spray is a solution of epinephrine hydrochloride in distilled water and has a potency equivalent to a solution containing 1 Gm. of U. S. P. Epinephrine Reference Standard in each 100 cc.

Epinephrine Hydrochloride Spray conforms to the *description* and *identification test* under *Liquor Epinephrinæ Hydrochloridi*, page 266.

Assay—

Standard Solution of Epinephrine Hydrochloride—Prepare a standard solution of Epinephrine Hydrochloride from the U. S. P. Epinephrine Reference Standard by the following procedure: Dissolve 50 mg. of the Reference Standard in 5 cc. of tenth-normal hydrochloric acid, and dilute to 50 cc. by the addition of distilled water, thus making a 1 in 1000 solution. Preserve this solution in a tightly stoppered, hard-glass container, and store under refrigeration and protected from light, except when in use. This solution must not be used if it shows any evidence of deterioration, such as change in color, or if it has been prepared for more than 6 months.

Preparation of the test dilutions—On the day of the assay, prepare a test dilution of the Standard Solution of Epinephrine Hydrochloride, using sufficient isotonic solution of sodium chloride, so that upon injection into the animal prepared for the assay as described on page 267, a dose of not less than 0.5 cc. and not more than 1.5 cc. will be required to produce a rise in blood pressure equivalent to 30 to 60 mm. of mercury. Prepare a similar test dilution of the Epinephrine Hydrochloride Spray to be assayed, using a 0.9 per cent solution of sodium chloride in 0.0001 normal hydrochloric acid, prepared by diluting 1 cc. of tenth-normal hydrochloric acid to 1000 cc. with isotonic solution of sodium chloride. Discard any test dilutions in which a trace of pink color develops.

From this point proceed with the assay under *Liquor Epinephrinæ Hydrochloridi*, page 266, beginning with the words "Preparation of the animal."

NOTE—Evidence of potency within 5 per cent below and 5 per cent above the standard is acceptable.

Storage—Preserve Epinephrine Hydrochloride Spray in small, well-filled, light-resistant, tight containers.

NEOARSPHENAMINA

Neoarsphenamine

Neoarsphen.

Neoarsphenamine consists chiefly of sodium 3,3'-diamino-4,4'-dihydroxyarsenobenzene-N-methanal sulfoxylate. It contains not less than 19 per cent of arsenic (As).

Neoarsphenamine must be prepared in an establishment licensed for the purpose by the United States Government upon recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with

the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Caution—Solutions of Neoarsphenamine must be freshly prepared when required for use. The solution should not be shaken during its preparation.

Description—Neoarsphenamine occurs as a yellow powder. It is odorless or has a slight odor. In the dry state or in solution it is readily oxidized by exposure to the air, becoming darker and more toxic. Higher temperatures accelerate the oxidation.

Solubility—Neoarsphenamine is very soluble in water. It is soluble in glycerin, slightly soluble in alcohol, and almost insoluble in dehydrated alcohol, in chloroform, and in ether.

Use recently boiled distilled water in the following tests:

Identification—

- A: Mix 0.5 cc. of diluted hydrochloric acid with 20 cc. of an aqueous solution of Neoarsphenamine (1 in 100): a heavy precipitate is produced within 1 minute.
- B: The addition of 2 drops of freshly prepared ferric chloride T.S. to 5 cc. of an aqueous solution of Neoarsphenamine (1 in 1000) produces a purple or purplish red color, changing to dark red.
- C: Add 3 cc. of silver nitrate T.S. to 5 cc. of an aqueous solution of Neoarsphenamine (1 in 100): a brown precipitate is immediately formed, which rapidly becomes black (*arsphenamine* produces a red color but no precipitate).
- D: To 10 cc. of an aqueous solution of Neoarsphenamine (1 in 100), add 10 cc. of diluted hydrochloric acid, and heat: the odor of sulfur dioxide is perceptible.
- E: The solution resulting from the *Assay for arsenic* yields with hydrogen sulfide a yellow precipitate which is soluble in ammonium carbonate T.S.
- F: An aqueous solution of Neoarsphenamine (1 in 100) is neutral or slightly alkaline to litmus paper (difference from *arsphenamine* and *sulfarsphenamine*).

Loss on drying—When dried for 24 hours in a vacuum desiccator over fresh phosphorus pentoxide, Neoarsphenamine loses not more than 1.5 per cent of its weight.

Completeness of solubility—Add 0.6 Gm. of Neoarsphenamine to 3 cc. of distilled water in a test tube or small cylinder and gently rotate the mixture: a complete solution results in 5 minutes.

Thermostability—Expose the ampuled product to a temperature of 70° C. for 48 hours: it shows no marked change in color, consistency, or solubility.

Assay for arsenic—Place about 0.2 Gm. of Neoarsphenamine, accurately weighed, in a glass-stoppered, 200- to 300-cc. flask. Add 1 Gm. of finely powdered potassium permanganate and 5 cc. of diluted sulfuric acid, and allow to stand for 10 minutes, rotating the contents of the flask during this time to insure thorough mixing. Cautiously add 10 cc. of sulfuric acid in portions of about 2 cc., rotating the flask after each addition. When the reaction has ceased, add sufficient hydrogen peroxide T.S. to dissolve completely the brown precipitate (about 5 to 7 cc.). Toward the end of the reaction the hydrogen peroxide T.S. is to be added drop by drop to avoid any great excess. Dilute with 25 cc. of distilled water, and boil gently over an asbestos-wire gauze for 15 to 20 minutes, or until the excess of hydrogen peroxide is expelled. Dilute with 50 cc. of distilled water, and add tenth-normal potassium permanganate until the liquid is faintly pink, then discharge the pink color by the addition of a drop of tenth-normal oxalic acid. Cool the solution, add 2.5 Gm. of potassium iodide, stopper the flask tightly, and allow it to stand in a cool, dark place for 1 hour. Then titrate the liberated iodine with tenth-normal sodium thiosulfate without the use of starch indicator. Perform a blank test with the same quantities of reagents, and in the same manner and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003746 Gm. of As.

Storage—Preserve Neoursphenamine in a cool place, preferably not above 20° C., in sealed tubes of colorless glass, from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams of the Neoursphenamine contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label on the outside of the container of one or more ampuls must bear the official title, the amount in grams of the Neoursphenamine contained in the individual ampul, the lot number of the product, the name and address of the manufacturer, the U. S. license number of the manufacturer, and the expiration date for the product.

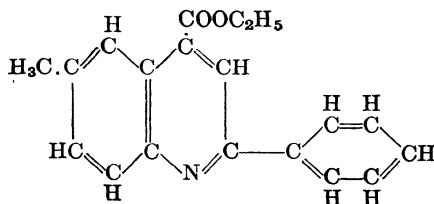
The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its stability) shall not be more than 3 years from the date of release of that lot by the National Institute of Health.

AVERAGE DOSE—Intravenous, Metric, 0.45 Gm.—Apothecaries, 7 grains.

NEOCINCHOPHENUM

Neocinchophen

Neocinchophen.



$C_{19}H_{17}O_2N$

Mol. wt. 291.33

Description—Neocinchophen is a white to pale yellow, crystalline powder. It is odorless and tasteless, is permanent in air, but is affected by light.

Solubility—Neocinchophen is nearly insoluble in water, is soluble in hot alcohol, and is very soluble in ether and in chloroform.

Melting point—The melting point of Neocinchophen is not below 74° C., page 595.

Identification—

- A: Boil a mixture of 0.1 Gm. of Neocinchophen with 1 cc. of sodium hydroxide T.S., and add 5 cc. of iodine T.S.: the odor of iodoform is apparent.
- B: Dissolve 0.1 Gm. of Neocinchophen in 1 cc. of sulfuric acid, and add an excess of bromine T.S., drop by drop: a yellow precipitate is produced.
- C: Add a few drops of ferric chloride T.S. to 5 cc. of an alcoholic solution of Neocinchophen (1 in 100): a yellow color is produced. (Cinchophen produces a reddish brown color.)

Loss on drying—When dried over sulfuric acid for 18 hours, Neocinchophen loses not more than 2 per cent of its weight.

Ash—Neocinchophen yields not more than 0.1 per cent of ash, page 556.

Cinchophen—Warm about 0.5 Gm. of Neocinchophen with 10 cc. of ammonia T.S., filter, and exactly neutralize the filtrate with hydrochloric acid: no precipitate is produced.

Storage—Preserve Neocinchophen in well-closed, light-resistant containers.

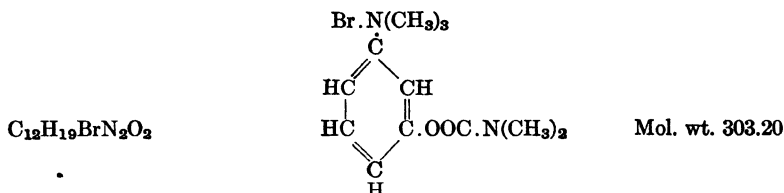
U. S. P. Product of Neocinchophen—Tabellæ Neocinchopheni.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

NEOSTIGMINÆ BROMIDUM

Neostigmine Bromide

Neostig. Bromid.



Neostigmine Bromide, when dried for 6 hours at 100°C ., contains not less than 98 per cent of $\text{C}_{12}\text{H}_{19}\text{BrN}_2\text{O}_2$.

Description—Neostigmine Bromide is a white, crystalline powder. It is odorless, and has a bitter taste.

Solubility—One Gm. of Neostigmine Bromide dissolves in about 1 cc. of water at 25°C . It is soluble in alcohol.

Melting point—Neostigmine Bromide melts with decomposition at about 167°C ., page 595.

Identification—

A: Place about 1 mg. of Neostigmine Bromide in a small porcelain dish, add 2 cc. of distilled water and 0.5 cc. of an aqueous solution of sodium hydroxide (2 in 5), and evaporate to dryness on a water bath, then transfer the residue to a small test tube, and quickly heat in an oil bath to 250°C ., continuing at that temperature for about 30 seconds. Cool, and dissolve the residue in 0.5 cc. of distilled water, cool again in ice water, and add 1 cc. of diazobenzenesulfonic acid T.S.: a cherry red color is produced.

B: An aqueous solution of Neostigmine Bromide (1 in 50) responds to the identity test for bromide, page 588.

Loss on drying—When dried at 100°C . for 6 hours, Neostigmine Bromide loses not more than 2 per cent of its weight.

Ash—Neostigmine Bromide yields not more than 0.15 per cent of ash, page 556.

Reaction—An aqueous solution of Neostigmine Bromide (1 in 10) is neutral to litmus paper.

Sulfate—Dissolve 0.25 Gm. of Neostigmine Bromide in 10 cc. of distilled water, add 1 cc. of diluted hydrochloric acid, and 1 cc. of barium chloride T.S.: no turbidity is produced immediately.

Assay—Place about 0.35 Gm. of Neostigmine Bromide, previously dried at 100°C . for 6 hours and accurately weighed, in a 500-cc. Kjeldahl flask, dissolve in 200 cc. of distilled water, and add 50 cc. of an aqueous solution of sodium hydroxide (1 in 10). Connect the flask by means of a distillation trap to a well-cooled condenser which dips into a vessel containing 25 cc. of tenth-normal sulfuric acid, accurately measured. Distil about 200 cc. of the contents of the flask, then add about 5 drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-normal sodium hydroxide. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 0.03032 Gm. of $\text{C}_{12}\text{H}_{19}\text{BrN}_2\text{O}_2$.

Storage—Preserve Neostigmine Bromide in tight containers.

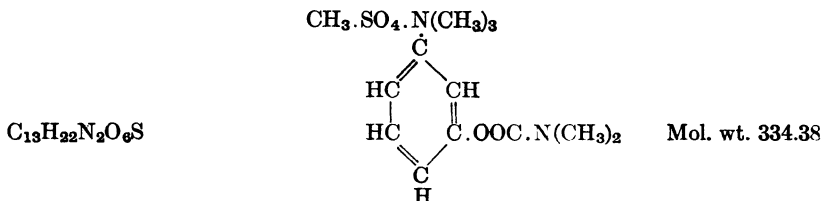
U. S. P. Product of Neostigmine Bromide—Tabellæ Neostigminæ Bromidi.

AVERAGE DOSE—Oral, Metric, 15 mg.—Apothecaries, $\frac{1}{4}$ grain.

NEOSTIGMINÆ METHYLSULFAS

Neostigmine Methylsulfate

Neostig. Methylsulf.



Neostigmine Methylsulfate, when dried at 100° C. for 6 hours, contains not less than 98 per cent of $\text{C}_{13}\text{H}_{22}\text{N}_2\text{O}_6\text{S}$.

Description—Neostigmine Methylsulfate is a white, crystalline powder. It is odorless, and has a bitter taste.

Solubility—One Gm. of Neostigmine Methylsulfate dissolves in about 10 cc. of water at 25° C. It is less soluble in alcohol.

Melting point—Neostigmine Methylsulfate melts between 142° and 145° C., page 595.

Identification—

A: Place about 1 mg. of Neostigmine Methylsulfate in a small porcelain dish, add 2 cc. of distilled water and 0.5 cc. of an aqueous solution of sodium hydroxide (2 in 5), and evaporate to dryness on a water bath. Transfer the residue to a small test tube, and quickly heat in an oil bath to 250° C., continuing at that temperature for about 30 seconds. Cool, and dissolve the residue in 0.5 cc. of distilled water, cool again in ice water, and add 1 cc. of diazobenzenesulfonic acid T.S.: a cherry red color is produced.

B: Intimately mix about 20 mg. of Neostigmine Methylsulfate with 0.5 Gm. of sodium carbonate, and heat the mixture to fusion in a small crucible. Boil the fused mass with 10 cc. of distilled water until disintegrated, and filter. Add a few drops of bromine T.S. to the filtrate, heat to boiling, acidify with hydrochloric acid, and expel the excess of bromine by boiling: the resulting solution responds to the identity test for sulfate, page 592.

Loss on drying—Dry about 0.3 Gm. of Neostigmine Methylsulfate, accurately weighed, at 100° C. for 6 hours: it loses not more than 1 per cent of its weight.

Ash—Neostigmine Methylsulfate yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Neostigmine Methylsulfate (1 in 10) is neutral to litmus paper.

Chloride—To 10 cc. of an aqueous solution of Neostigmine Methylsulfate (1 in 50), add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: no opalescence results immediately.

Sulfate ion—To 10 cc. of an aqueous solution of Neostigmine Methylsulfate (1 in 50), add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity results immediately.

Assay—Place about 0.35 Gm. of Neostigmine Methylsulfate, previously dried at 100° C. for 6 hours and accurately weighed, in a 500-cc. Kjeldahl flask, dissolve in 200 cc. of distilled water, and add 50 cc. of an aqueous solution of sodium hydroxide (1 in 10). Connect the flask by means of a distillation trap to a well-cooled condenser which dips into a vessel containing 25 cc. of tenth-normal sulfuric acid. Distill about 200 cc. of the contents of the flask, then add about 5 drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-

normal sodium hydroxide. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 0.03344 Gm. of $C_{13}H_{22}N_2O_6S$.

Storage—Preserve Neostigmine Methylsulfate in tight containers.

U. S. P. Product of Neostigmine Methylsulfate—Injectio Neostigminæ Methylsulfatis.

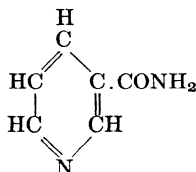
AVERAGE DOSE—Subcutaneous, Metric, 0.5 mg.—Apothecaries, $\frac{1}{20}$ grain.

NICOTINAMIDUM

Nicotinamide

Nicotinamid.—Nicotinic Acid Amide, Niacinamide

$C_6H_6N_2O$



Mol. wt. 122.12

Nicotinamide, when dried over sulfuric acid for 18 hours, contains not less than 98.5 per cent of $C_6H_6N_2O$.

Description—Nicotinamide is a white, crystalline powder. It is odorless or nearly so, and has a bitter taste.

Solubility—One Gm. of Nicotinamide dissolves in about 1 cc. of water, in about 1.5 cc. of alcohol, and in about 10 cc. of glycerin, at 25° C.

Melting point—Nicotinamide melts between 128° and 131° C., page 595.

Identification—

A: To the solution remaining in the distilling flask following the completion of the assay, add diluted sulfuric acid until the solution has a faintly acid reaction to litmus paper, then add 2 cc. of cupric sulfate T.S.: a dark blue precipitate is slowly formed.

B: To 20 mg. of Nicotinamide in a test tube add 5 cc. of sodium hydroxide T.S., and boil the mixture gently: the odor of ammonia is perceptible.

C: Char about 10 mg. of Nicotinamide on a piece of platinum foil: the characteristic odor of pyridine is evolved.

Loss on drying—When dried over sulfuric acid for 18 hours, Nicotinamide loses not more than 0.5 per cent of its weight.

Ash—Nicotinamide yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Nicotinamide in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—An aqueous solution of Nicotinamide (1 in 10) is neutral to litmus paper.

Heavy metals—Dissolve 1 Gm. of Nicotinamide in 10 cc. of distilled water, add 7.5 cc. of normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Nicotinamide is 30 parts per million.

Assay—Place about 0.3 Gm. of Nicotinamide, previously dried over sulfuric acid for 18 hours and accurately weighed, in a 500-cc. Kjeldahl flask, dissolve it in 200 cc. of distilled water, and add 50 cc. of a 30 per cent aqueous solution of sodium hydroxide. Connect the flask by means of a distillation trap to a well-cooled con-

denser which dips into a vessel containing 40 cc. of tenth-normal sulfuric acid, accurately measured. Boil gently for 20 minutes and then distil about 200 cc. of the contents of the flask. Add a few drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-normal sodium hydroxide. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 0.01221 Gm. of $C_6H_6N_2O$.

Storage—Preserve Nicotinamide in tight containers.

U. S. P. Product of Nicotinamide—Tabellæ Nicotinamidi.

AVERAGE DOSE—Metric, 25 mg.—Apothecaries, $\frac{3}{8}$ grain.

NUX VOMICA

Nux Vomica

Nux. Vom.—Strychni semen P.I.

Nux Vomica is the dried ripe seed of *Strychnos Nux-vomica* Linné (Fam. *Loganiaceæ*).

Nux Vomica yields not less than 1.15 per cent of strychnine.

Description—

Unground Nux Vomica—Seed orbicular, nearly flat, occasionally somewhat bent, from 10 to 30 mm. in diameter, and from 3 to 6 mm. in thickness; externally grayish or from pale brown to pale olive, covered with appressed hairs, giving it a silky luster; hilum indicated by a circular scar at the center of one of the flattened sides, and connected with the micropyle by a radial raphe; very hard when dry; beneath the thin and hairy seed-coat is a large yellow to weak yellowish green endosperm at one end of which is embedded a small embryo with two cordate 5- to 7-nerved cotyledons; inodorous; taste intensely and persistently bitter.

Histology—Transverse sections of the seed exhibit a thin spermoderm of collapsed cells from which project numerous appressed, twisted, thick-walled, lignified hairs with enlarged bases possessing slit-like pits and branched lumina, their long, bent bodies possessing walls with long, curved, narrow slits. Beneath the spermoderm occurs a broad endosperm of polygonal cells showing well-marked plasmodesmata, very thick walls of reserve cellulose, and lumina containing oily plasma and occasional aleurone grains.

Powdered Nux Vomica—Pale brown to yellowish gray; consisting chiefly of thick-walled endosperm cells containing globules of a fixed oil and a few small aleurone grains up to 30 microns in diameter, fragments of strongly lignified, non-glandular hairs, the walls of the latter possessing large, circular, or long, slit-like pores. In the tissues of the adhering pulp occur a few small, nearly spherical starch grains.

Assay—Place 15 Gm. of Nux Vomica, in coarse powder, in a flask or bottle, add 150 cc., measured at 25° C., of a mixture of 3 volumes of ether and 1 volume of chloroform, tightly stopper the flask, shake the mixture, and allow it to stand for about 2 minutes. Then add 10 cc. of stronger ammonia T.S., stopper the flask tightly, shake frequently, but gently, during 1 hour, and allow the mixture to stand over night at a temperature not over 25° C. Again shake the flask gently for 15 minutes, and allow the liquids to separate at 25° C. Then quickly transfer to a separator exactly 100 cc. of the liquid, representing 10 Gm. of Nux Vomica,

rinse the measuring vessel with a little chloroform, and add the rinsings to the separator. Add about 40 cc. of approximately normal sulfuric acid to the separator, and shake the mixture gently for 5 minutes, then allow the liquids to separate, and draw off the acid layer into another separator. Repeat the extraction with successive portions of the acid, until the ether solution is completely extracted (see *Purification of the Alkaloids*, page 604).

To the combined acid solutions in the separator, add a small piece of red litmus paper and 50 cc. of chloroform, and follow with sufficient ammonia T.S. to render the aqueous layer alkaline, and after gently shaking, add 2 or 3 cc. more of the ammonia T.S. Now shake the mixture thoroughly, but gently, for about 10 minutes, and allow the liquids to separate. Draw off the chloroform into a container, and repeat the extraction with additional portions of chloroform until all of the alkaloid is extracted. Extract the combined chloroform solutions with successive portions of approximately normal sulfuric acid until completely extracted. Then render the combined acid solutions alkaline with ammonia T.S., add 2 or 3 cc. more of the ammonia T.S., and completely extract the alkaloids with successive portions of chloroform.

Carefully evaporate the combined chloroform extracts to dryness on a water bath, dissolve the residue by warming with 15 cc. of approximately 3 per cent sulfuric acid, cool to 25° C., and add 3 cc. of a mixture of equal parts of nitric acid and a 5 per cent solution of sodium nitrite in distilled water. Thoroughly stir this mixture, and allow it to stand for exactly 10 minutes at room temperature. At the expiration of this period, pour at once the red solution into a separator containing 50 cc. of chloroform and 15 cc. of 10 per cent sodium hydroxide solution, and rinse the flask with distilled water, adding the rinsings to the separator. Add sufficient 10 per cent sodium hydroxide solution to the contents of the separator to render it distinctly alkaline to litmus paper, and then add a few cc. more of the sodium hydroxide solution. Shake the mixture gently for 10 minutes and allow the liquids to separate. Draw off the chloroform layer into another separator and repeat the extraction with additional portions of chloroform until the alkaloid is completely removed. Add 10 cc. of distilled water to the combined chloroform extract, shake the mixture gently, and add a small piece of red litmus paper. The litmus paper should indicate not more than a slight alkalinity. If the water, after shaking with the chloroform, is strongly alkaline, draw off the chloroform into another separator, and shake it with another 10 cc. of distilled water. Draw off the chloroform, passing it through a filter paper moistened with chloroform, into a container. Wash the filter paper with warm chloroform, and add these rinsings also to the container. Now shake the combined aqueous extract with 5 cc. of chloroform and draw off this chloroform, passing it through the chloroform-moistened filter paper into the main chloroform solution.

Evaporate the combined chloroform extracts very carefully on a water bath nearly, but not quite, to dryness. Add to the moist residue 7 cc. of tenth-normal sulfuric acid, accurately measured, follow with 30 cc. of distilled water, and heat the mixture on a water bath until the alkaloid is dissolved and the odor of chloroform is dissipated. Cool to room temperature, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using 1 drop of methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.03344 Gm. of strychnine.

U. S. P. Products of Nux Vomica—Strychninæ Sulfas, Tabellæ Strychninæ Sulfatis, Tinctura Nucis Vomiceæ.

OLEATUM HYDRARGYRI

Oleate of Mercury

Oleat. Hydrarg.

Oleate of Mercury contains the equivalent of not less than 24 per cent and not more than 26 per cent of HgO.

Caution—Oleate of Mercury must not be dispensed if globules of mercury have separated.

YELLOW MERCURIC OXIDE, in very fine powder..... 25 Gm.

OLEIC ACID, a sufficient quantity,

To make..... 100 Gm.

Mix the yellow mercuric oxide with 75 Gm. of oleic acid in a non-metallic vessel, warm the mixture to a temperature not exceeding 50° C., stir constantly for 5 minutes, and then continue the heat, stirring frequently, until the mercuric oxide is dissolved. Add sufficient oleic acid to make the product weigh 100 Gm., and mix thoroughly.

Description—Oleate of Mercury is a yellowish brown, somewhat transparent substance, ointment-like in consistence, and having the odor of oleic acid. It is affected by light and is darkened by hydrogen sulfide.

Solubility—Oleate of Mercury is slightly soluble in alcohol and in ether, and is readily soluble in fixed oils.

Assay—Accurately weigh about 0.75 Gm. of Oleate of Mercury on a small piece of paper. Transfer the paper and Oleate to a Kjeldahl flask of about 300-cc. capacity. Add 10 cc. of sulfuric acid, and heat on a water bath for 10 minutes, gently agitating the mixture at frequent intervals. Insert a small funnel in the neck of the flask, and slowly add 10 cc. of nitric acid. Heat the mixture with a Bunsen burner flame, at first gently, and then more strongly, until the solution is colorless or only slightly yellow, adding more nitric acid if necessary and keeping the funnel in the neck of the flask during heating. Allow the solution to cool sufficiently, and carefully add through the funnel about 30 cc. of distilled water, rinsing the stem of the funnel with a few cc. of distilled water and allowing the rinsings to run into the flask. Then to the warm solution add potassium permanganate T.S. until slight pink color persists. Cool the solution, discharge its color by the addition of just sufficient oxalic acid T.S., add 50 cc. of distilled water and 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01083 Gm. of HgO.

Storage—Preserve Oleate of Mercury in tight, light-resistant containers.

OLEORESINA ASPIDII

Oleoresin of Aspidium

Oleores. Aspid.—Oleoresin of Male Fern, Oleoresin of Marginal Fern

Oleoresin of Aspidium yields not less than 24 per cent of crude filicin.

ASPIDIUM, recently reduced to coarse powder..... 500 Gm.

ETHER, a sufficient quantity.

Place the aspidium in a cylindrical glass percolator provided with a stopcock, and with a cover and a receptacle suitably arranged for safe use with volatile liquids. Pack the powder firmly, and percolate slowly with ether added in successive portions until the drug is exhausted. Recover the greater part of the ether from the percolate by distillation

on a water bath, and, having transferred the residue to a dish, allow the remaining ether to evaporate spontaneously in a warm place, remote from a naked flame.

Description—A dark green, thick liquid, usually depositing a granular, crystalline substance, which must be thoroughly mixed with the liquid portion before use.

Solubility—Not less than 85 per cent of the Oleoresin is soluble in purified benzin.

Specific gravity—Not less than 1.00 at 25° C.

Assay—Warm the Oleoresin of *Aspidium* on a water bath, and stir until it is thoroughly mixed. Transfer about 3 Gm. of it, accurately weighed, to a 250-cc. flask, and dissolve it in 40 cc. of ether. Add 75 cc. of a 3 per cent aqueous solution of barium hydroxide, and shake the mixture vigorously for 5 minutes. Transfer the mixture to a separator, allow the liquids to separate completely, and draw off and filter the barium hydroxide layer. Rinse the flask with two 25-cc. portions of a 3 per cent aqueous solution of barium hydroxide, transfer each rinsing separately to the separator, shake the mixture for 1 minute, allow the liquids to separate completely, and draw off and filter the barium hydroxide layer. Transfer the combined filtered barium hydroxide solutions to a separator, render distinctly acid to litmus paper by the addition of hydrochloric acid, and extract with three successive portions of 30, 20, and 15 cc. of ether. Filter the combined ether solutions, and wash the filter with ether. Evaporate the filtrate and washings, and dry the residue to constant weight at 100° C. The weight of the crude filicin so obtained is not less than 24 per cent of the weight of Oleoresin taken for the assay.

Storage—Preserve Oleoresin of *Aspidium* in well-closed containers.

AVERAGE DOSE—*Caution!* Single dose, Metric, 4 Gm.—
Apothecaries, 60 grains.

OLEOVITAMINA A

Oleovitamin A

Oleovitam. A—Natural Vitamin A in Oil

Oleovitamin A is either fish liver oil, or fish liver oil diluted with an edible vegetable oil, or a solution of Vitamin A concentrate in fish liver oil or in an edible vegetable oil. The Vitamin A shall be obtained from natural (animal) sources. Oleovitamin A contains in each Gm. not less than 50,000 and not more than 65,000 U. S. P. Units of Vitamin A, and not more than 1000 U. S. P. Units of Vitamin D.

Description—Oleovitamin A is a thin, oily liquid which may have a fishy, but not rancid, odor and taste.

Free fatty acids—Dissolve 2 Gm. of Oleovitamin A, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, and boil the solution gently under a reflux condenser for 10 minutes. Cool and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking the mixture for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Assays—Proceed as directed under *Vitamins A and D Assays*, page 635.

Storage—Preserve Oleovitamin A in tight containers. It may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

U. S. P. Product of Oleovitamin A—Capsulæ Oleovitaminæ A.

AVERAGE DAILY DOSE—Prophylactic, infants and adults,
Metric, 0.1 cc.—Apothecaries, $1\frac{1}{2}$ minims.

OLEOVITAMINA A ET D

Oleovitamin A and D

Oleovitam. A et D

Oleovitamin A and D is either fish liver oil, or fish liver oil diluted with an edible vegetable oil, or a solution of Vitamin A and D concentrates in fish liver oil or in an edible vegetable oil. The Vitamin A shall be obtained from natural (animal) sources and the Vitamin D may be obtained from natural (animal) sources or may be synthetic Oleovitamin D. Oleovitamin A and D contains in each Gm. not less than 850 and not more than 1100 U. S. P. Units of Vitamin A, and not less than 85 and not more than 110 U. S. P. Units of Vitamin D.

Oleovitamin A and D may be flavored by the addition of not more than 1 per cent of any one or any mixture of flavoring substances recognized in this Pharmacopœia.

Description—Oleovitamin A and D is a thin, oily liquid, which may have a fishy, but not rancid, odor and taste.

Solubility—Oleovitamin A and D is slightly soluble in alcohol, but is miscible in all proportions with ether and with chloroform.

Color—When viewed transversely in a tall, cylindrical, standard, oil-sample bottle of colorless glass of about 120-cc. capacity, the color of Oleovitamin A and D shall not be more intense than that of a mixture of 11 cc. of cobaltous chloride C.S., 76 cc. of ferric chloride C.S., and 33 cc. of distilled water, in a similar bottle of the same internal diameter.

Free fatty acids—Dissolve 2 Gm. of Oleovitamin A and D, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, and boil the solution gently under a reflux condenser for 10 minutes. Cool and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Assays—Proceed as directed under *Vitamins A and D Assays*, page 635.

Storage—Preserve Oleovitamin A and D in tight containers. It may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

AVERAGE DAILY DOSE—Infants and adults, Metric, 8 cc.—
Apothecaries, 2 fluidrachms.

OLEOVITAMINÆ A ET D CONCENTRATA

Concentrated Oleovitamin A and D

Oleovitam. A et D Conc.

Concentrated Oleovitamin A and D is either fish liver oil, or fish liver oil diluted with an edible vegetable oil, or a solution of Vitamin A and D concentrates in fish liver oil or in an edible vegetable oil. The Vitamin A shall be obtained from natural (animal) sources and the Vitamin D may be obtained from natural (animal) sources or may be synthetic oleovitamin D. Concentrated Oleovitamin A and D contains in each Gm. not less than 50,000 and not more than 65,000 U. S. P. Units of Vitamin A, and not less than 10,000 and not more than 13,000 U. S. P. Units of Vitamin D.

Description—Concentrated Oleovitamin A and D is a thin, oily liquid which may have a fishy, but not rancid, odor and taste.

Free fatty acids—Dissolve 2 Gm. of Concentrated Oleovitamin A and D, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, and boil the solution gently under a reflux condenser for 10 minutes. Cool and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking the mixture for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Assays—Proceed as directed under *Vitamins A and D Assays*, page 635.

Storage—Preserve Concentrated Oleovitamin A and D in tight containers. It may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

U. S. P. Product of Concentrated Oleovitamin A and D—Capsulæ Oleovitaminæ A et D Concentratæ.

AVERAGE DAILY DOSE—Prophylactic, infants and adults,
Metric, 0.1 cc.—Apothecaries, $1\frac{1}{2}$ minims.

OLEOVITAMINA D SYNTHETICA

Synthetic Oleovitamin D

Oleovitam. D Synth.—Viosterol in Oil (Applying only to Activated Ergosterol in Oil)

Synthetic Oleovitamin D is a solution of activated ergosterol, or activated 7-dehydro-cholesterol, in an edible vegetable oil. Synthetic Oleovitamin D contains in each Gm. not less than 10,000 U. S. P. Units of Vitamin D.

Synthetic Oleovitamin D must be labeled to indicate whether it contains activated ergosterol (*Vitamin D₂* or *Viosterol*) or whether it contains activated 7-dehydro-cholesterol (*Vitamin D₃*).

Description—Synthetic Oleovitamin D is a clear, colorless to light yellow, oily liquid. It is almost odorless, and has a bland taste.

Solubility—Synthetic Oleovitamin D is slightly soluble in alcohol, but is miscible with ether and with chloroform.

Free fatty acids—The free fatty acids in 2 Gm. of Synthetic Oleovitamin D shall require for neutralization not more than 1.5 cc. of fiftieth-normal sodium hydroxide, page 578.

Assay—Proceed as directed under *Vitamins A and D Assays*, page 635.

Storage—Preserve Synthetic Oleovitamin D in small, tight containers, preferably in a cold place.

AVERAGE DAILY DOSE—Prophylactic, Metric, 0.1 cc.—Apothecaries, $1\frac{1}{2}$ minims.

OLEUM AMYGDALÆ AMARÆ

Oil of Bitter Almond

Ol. Amygd. Amar.—Bitter Almond Oil

Oil of Bitter Almond is the volatile oil obtained from the dried ripe kernels (deprived of fixed oils) of *Amygdalus communis* Linné (Fam. *Rosaceæ*), or from other kernels containing amygdalin, by maceration with water and subsequent distillation with steam. It contains not less than 80 per cent of benzaldehyde ($C_6H_5.CHO$), and not less than 2 per cent and not more than 4 per cent of hydrogen cyanide (HCN).

Oil in which crystals have formed must not be dispensed.

Caution—This Oil is intended for medicinal use and neither it nor its solution should be used or sold for flavoring foods.

Description—Oil of Bitter Almond is a clear, colorless or yellow, strongly refractive liquid, having the characteristic odor and taste of benzaldehyde.

Solubility—Oil of Bitter Almond is slightly soluble in water. It is miscible with alcohol and with ether. It forms a clear solution with 2 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Oil of Bitter Almond is not less than 1.038 and not more than 1.060 at 25° C.

Optical rotation—Oil of Bitter Almond is optically inactive or has an optical rotation of not more than $+0^{\circ} 10'$ in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Bitter Almond is not less than 1.5410 and not more than 1.5442 at 20° C., page 608.

Reaction—When first prepared, Oil of Bitter Almond is neutral to moistened litmus paper, but afterwards develops an acid reaction, due to the formation of benzoic acid.

Heavy metals—Oil of Bitter Almond meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Halogens—Rinse the interior surface of a well-cleaned, 1000-cc. beaker with successive portions of distilled water, passing the washings through a small filter until the last filtered washing, acidulated with 1 drop of nitric acid and treated with 1 drop of silver nitrate T.S., shows no turbidity. Place 3 or 4 drops of the Oil on a clean watch glass supported on a triangle, ignite the Oil, and immediately

invert the moistened beaker over it. Wash the products of combustion from the sides of the beaker through the washed filter with from 10 to 20 cc. of distilled water, acidulate the filtrate with 1 drop of nitric acid, and add 1 drop of silver nitrate T.S.: the mixture does not become turbid.

Nitrobenzene—Add 10 drops of Oil of Bitter Almond to 5 cc. of alcohol, then add a small amount of zinc dust and 2 cc. of acetic acid, and boil the mixture for about 10 seconds. Render the liquid strongly alkaline with sodium hydroxide T.S., add a few drops of chloroform, and heat the mixture: the warm mixture has no odor of phenylisocyanide.

Assay for benzaldehyde—Add 0.1 cc. of bromophenol blue T.S. to 25 cc. of a solution made by dissolving 3.5 Gm. of hydroxylamine hydrochloride in sufficient 60 per cent alcohol to make 100 cc., and titrate with half-normal alcoholic potassium hydroxide to the production of a greenish blue color. Pour this mixture into a flask fitted with a glass stopper and containing about 1 Gm. of Oil of Bitter Almond, accurately weighed. Shake well, and titrate with half-normal alcoholic potassium hydroxide until the yellow color changes to greenish blue. Continue shaking and titrating until the greenish blue color is permanent. Each cc. of half-normal alcoholic potassium hydroxide is equivalent to 0.05306 Gm. of C_6H_5CHO .

Assay for hydrogen cyanide—Dissolve 0.75 Gm. of magnesium sulfate in 45 cc. of distilled water, add 5 cc. of half-normal sodium hydroxide and 2 drops of potassium chromate T.S., and titrate the solution with tenth-normal silver nitrate to the production of a permanent reddish tint. Pour this mixture into a 100-cc. flask containing 1 Gm. of Oil of Bitter Almond, accurately weighed, mix well, and titrate again with tenth-normal silver nitrate until a red tint, which does not disappear on shaking, is produced. Conduct this titration as rapidly as possible. Each cc. of tenth-normal silver nitrate is equivalent to 0.002703 Gm. of HCN.

Storage—Preserve Oil of Bitter Almond in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM AMYGDALÆ EXPRESSUM

Expressed Almond Oil

Oil. Amygd. Exp.—Oil of Sweet Almond

Expressed Almond Oil is the fixed oil obtained from the kernels of varieties of *Amygdalus communis* Linné (Fam. *Rosaceæ*).

Description—Expressed Almond Oil is a clear, pale straw colored or colorless, oily liquid. It is almost odorless, and has a bland taste.

Solubility—Expressed Almond Oil is slightly soluble in alcohol, but is miscible with ether, chloroform, benzene, and with purified benzin.

Specific gravity—The specific gravity of Expressed Almond Oil is not less than 0.910 and not more than 0.915 at 25° C.

Congealing temperature—Expressed Almond Oil remains clear at -10° C., and does not congeal until cooled to nearly -20° C.

Foreign kernel oils, sesame, or cottonseed oil—Shake vigorously for 5 minutes 2 cc. of Expressed Almond Oil with a mixture of 1 cc. of fuming nitric acid and 1 cc. of distilled water: the mixture is not more than slightly colored. (Oil of peach kernels or oil of apricot kernels yields a red mixture, and sesame oil or cottonseed oil yields a brown mixture when similarly treated.)

Mineral oil and foreign fatty oils—Heat on a water bath 10 cc. of Expressed Almond Oil with 15 cc. of an aqueous solution of sodium hydroxide (1 in 6) and 30 cc. of alcohol in a flask which has a small, short-stemmed funnel inserted in the neck, and occasionally agitate the mixture until it becomes clear. Transfer the solu-

tion to a shallow dish, evaporate the alcohol on a water bath, and mix the residue with 100 cc. of distilled water: a clear solution results (*mineral oil*). Add an excess of hydrochloric acid to this solution, remove the layer of fatty acids which rises to the surface, wash it with warm water, clarify it by heating on a water bath, and allow it to cool to 15° C. without stirring: the fatty acids remain clear for 30 minutes at this temperature (*foreign fatty oils*).

Foreign oils—One volume of the mixed fatty acids obtained in the preceding test, when mixed with 1 volume of alcohol, yields a clear solution, which at 15° C. does not deposit any fatty acid or become turbid upon the further addition of 1 volume of alcohol (*olive, peanut, cottonseed, sesame, or other fixed oils*).

Saponification value—The saponification value of Expressed Almond Oil is not less than 190 and not more than 200, page 579.

Iodine value—The iodine value of Expressed Almond Oil is not less than 95 and not more than 105, page 579.

Storage—Preserve Expressed Almond Oil in tight containers.

OLEUM ANISI

Oil of Anise

Ol. Anisi—Anise Oil

Oil of Anise is the volatile oil distilled with steam from the dried ripe fruit of *Pimpinella Anisum* Linné (Fam. *Umbelliferæ*) or from the dried ripe fruit of *Illicium verum* Hooker filius (Fam. *Magnoliaceæ*).

Note—If solid material has separated, carefully warm the mixture at a low temperature until it is completely liquefied, and mix it thoroughly before using.

Description—Oil of Anise is a colorless or pale yellow, strongly refractive liquid, having the characteristic odor and taste of anise.

Solubility—Oil of Anise is soluble with not more than a slight cloudiness in 3 volumes of 90 per cent alcohol.

Specific gravity—The specific gravity of Oil of Anise is not less than 0.978 and not more than 0.988 at 25° C.

Congealing temperature—The congealing point of Oil of Anise is not below 15° C., page 566.

Optical rotation—The optical rotation of Oil of Anise is not less than -2° and not more than $+1^{\circ}$ in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Anise is not less than 1.5530 and not more than 1.5600 at 20° C., page 608.

Heavy metals—Oil of Anise meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Phenols—A solution of recently distilled Oil of Anise in 90 per cent alcohol (1 in 3) is neutral to moistened litmus paper, and the mixture develops no blue or brownish color upon the addition of 1 drop of ferric chloride T.S. to 5 cc. of the solution.

Storage—Preserve Oil of Anise in well-filled, tight containers and avoid exposure to excessive heat.

U. S. P. Products of Oil of Anise—Aqua Anisi, Spiritus Anisi.

OLEUM AURANTII

Oil of Orange

Ol. Aurant.—Orange Oil, Oil of Sweet Orange

Oil of Orange is the volatile oil obtained by expression from the fresh peel of the ripe fruit of *Citrus Aurantium* Linné var. *sinensis* Linné (Fam. *Rutaceæ*).

Note—Oil of Orange which has a terebinthinate odor must not be used or dispensed.

Description—Oil of Orange is an intense yellow, orange, or deep orange liquid, having the characteristic odor and taste of the outer part of fresh sweet orange peel.

Solubility—Oil of Orange is miscible with dehydrated alcohol and with carbon disulfide, and dissolves in an equal volume of glacial acetic acid.

Specific gravity—The specific gravity of Oil of Orange is not less than 0.842 and not more than 0.846 at 25° C.

Optical rotation—The optical rotation of Oil of Orange is not less than +94° and not more than +99° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Orange is not less than 1.4723 and not more than 1.4737 at 20° C., page 608.

Reaction—A solution of recently expressed Oil of Orange in dehydrated (1 in 5) alcohol is neutral to moistened litmus paper.

Heavy metals—Oil of Orange meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Washed citrus oils—

A: Evaporate 5 Gm. of Oil of Orange to constant weight at 100° C.: the residue weighs not less than 0.085 Gm.

B: Oil of Orange does not form a clear solution with 2 volumes of 90 per cent alcohol.

Foreign oils—Place 50 cc. of Oil of Orange in a 100-cc., three-bulb Ladenburg flask of approximately the following dimensions: the lower or main bulb 6 cm. in diameter, with the smaller condensing bulbs 3.5 cm., 3.0 cm., and 2.5 cm., respectively, in diameter; the distance from the bottom of the flask to the side arm 20 cm. Distill the Oil at the rate of 1 drop per second until the distillate measures 5 cc.: the optical rotation of the distillate is equal to that of the original Oil or does not differ from it by more than 2 degrees, and the refractive index of the distillate is not less than 0.0008 and not more than 0.0015 lower than that of the original Oil at 20° C.

Storage—Preserve Oil of Orange in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM CARYOPHYLLI

Oil of Clove

Ol. Caryoph.—Oil of Cloves

Oil of Clove is the volatile oil distilled with steam from the dried flower buds of *Eugenia caryophyllata* Thunberg (Fam. *Myrtaceæ*). It contains not less than 82 per cent by volume of eugenol ($C_{10}H_{12}O_2$).

Description—Oil of Clove is a colorless or pale yellow liquid, becoming darker and thicker by age or exposure to air, and having the characteristic odor and taste of clove.

Solubility—Oil of Clove is soluble in 2 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Oil of Clove is not less than 1.038 and not more than 1.060 at 25° C.

Optical rotation—The optical rotation of Oil of Clove is not more than $-1^{\circ} 30'$ in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Clove is not less than 1.5300 and not more than 1.5350 at 20° C., page 608.

Reaction—A solution of recently distilled Oil of Clove in 70 per cent alcohol (1 in 2) is slightly acid to moistened blue litmus paper.

Heavy metals—Oil of Clove meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Phenol—Shake 1 cc. of Oil of Clove with 20 cc. of hot distilled water: the water shows not more than a scarcely perceptible acid reaction with blue litmus paper. Cool the mixture, pass the aqueous layer through a wetted filter, and treat the clear filtrate with 1 drop of ferric chloride T.S.: the mixture has only a transient, grayish-green color, but not a blue or violet color.

Assay—Place 10 cc. of Oil of Clove, measured from a pipette, in a 100-cc. cassia flask, add 50 cc. of normal potassium hydroxide solution, shake the mixture for 5 minutes, and heat it for 10 minutes in a bath containing boiling water. Remove it from the bath, and cool to room temperature. When the liquids have separated completely, add sufficient normal potassium hydroxide to raise the lower limit of the oily layer within the graduated portion of the neck: the volume of the oily layer should not exceed 1.8 cc., indicating the presence in the Oil of not less than 82 per cent by volume of eugenol ($C_{10}H_{12}O_2$).

Storage—Preserve Oil of Clove in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM CEDRI FOLII

Oil of Cedar Leaf

Ol. Ced. Fol.—Oil of Arbor Vitæ, Oil of Thuja

Oil of Cedar Leaf is the volatile oil distilled with steam from the fresh leaves of *Thuja occidentalis* Linné (Fam. *Pinaceæ*). Oil of Cedar Leaf contains not less than 60 per cent of ketones, calculated as thujone ($C_{10}H_{16}O$).

Description—Oil of Cedar Leaf is a colorless or yellow liquid, having the characteristic odor of arbor vitæ.

Solubility—Oil of Cedar Leaf is soluble in 3 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Oil of Cedar Leaf is not less than 0.910 and not more than 0.920 at 25° C.

Optical rotation—The optical rotation of Oil of Cedar Leaf is not less than -10° and not more than -13° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Cedar Leaf is not less than 1.4560 and not more than 1.4590 at 20° C., page 608.

Assay—Dissolve 5 Gm. of hydroxylamine hydrochloride in 9 cc. of warm distilled water, add 80 cc. of 90 per cent alcohol and 2 cc. of bromophenol blue T.S. Neutralize the mixture with half-normal alcoholic potassium hydroxide, and add sufficient 90 per cent alcohol to make 100 cc. Weigh accurately about 1 Gm. of the Oil, add 20 cc. of the hydroxylamine reagent, shake the mixture, and titrate it slowly, with frequent agitation, with half-normal alcoholic potassium hydroxide. Continue the titration for 4 hours, neutralizing at intervals of 30 minutes. Each cc. of half-normal alcoholic potassium hydroxide is equivalent to 0.0761 Gm. of ketones, calculated as thujone ($C_{10}H_{16}O$).

Storage—Preserve Oil of Cedar Leaf in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM CHAULMOOGRÆ

Chaulmoogra Oil

Ol. Chaulmoog.—Hydnocarpus Oil

Chaulmoogra Oil is the fixed oil expressed from the ripe seed of *Taraktogenos Kurzii* King, *Hydnocarpus Wightiana* Blume, or *Hydnocarpus anthelmintica* Pierre (Fam. *Flacourtiaceæ*). The fixed oil expressed from the ripe seed of other species of *Hydnocarpus* (Fam. *Flacourtiaceæ*), when designated as such and when conforming to the description and physical properties and meeting the requirements of the tests prescribed below, may be used.

Description—Chaulmoogra Oil is a yellow or brownish yellow liquid, or, at temperatures below about 25° C., a whitish, soft solid. It has a characteristic odor, and a somewhat acrid taste.

Solubility—Chaulmoogra Oil is sparingly soluble in alcohol. It is soluble in benzene, in chloroform, in ether, and in purified benzin.

Specific gravity—The specific gravity of Chaulmoogra Oil is not less than 0.940 and not more than 0.960 at 25° C.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Chaulmoogra Oil determined in chloroform solution containing 10 Gm. of the Oil in each 100 cc. of solution is not less than +48° and not more than +60°, page 601.

Castor oil or free fatty acids—Place 25 cc. of Chaulmoogra Oil in a measuring tube consisting of a glass-stoppered, pear-shaped bulb of not less than 100-cc. capacity, joined at its lower tapering end to a tube about 30 cm. long, and graduated to 25 cc. in divisions of 0.1 cc. Add 100 cc. of neutralized alcohol, and shake the mixture thoroughly for not less than 10 minutes. Allow the tube to stand for 24 hours, and observe the volume of the lower layer: its volume is not less than 23.5 cc.

Saponification value—The saponification value of Chaulmoogra Oil is not less than 196 and not more than 213, page 579.

Iodine value—The iodine value of Chaulmoogra Oil is not less than 93 and not more than 104, page 579.

Acid value—The free fatty acids in 10 Gm. of Chaulmoogra Oil require not more than 40 cc. of tenth-normal sodium hydroxide for neutralization, page 578.

Storage—Preserve Chaulmoogra Oil in well-filled, tight, light-resistant containers.

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

OLEUM CHENOPODII

Oil of Chenopodium

Ol. Chenopod.—Oil of American Wormseed

Oil of Chenopodium is the volatile oil distilled with steam from the fresh, over-ground parts of the flowering and fruiting plant of *Chenopodium ambrosioides* Linné var. *anthelminticum* (Linné) A. Gray (Fam. *Chenopodiaceæ*). It contains not less than 65 per cent, by weight, of ascaridol, $C_{10}H_{16}O_2$.

Description—Oil of *Chenopodium* is a liquid of pale yellow to orange yellow color, having a peculiar, unpleasant odor, and a bitter, burning taste.

Solubility—Oil of *Chenopodium* is soluble in not more than 8 volumes of 70 per cent alcohol at 25° C.

Specific gravity—The specific gravity of Oil of *Chenopodium* is not less than 0.950 and not more than 0.980 at 25° C.

Optical rotation—The optical rotation of Oil of *Chenopodium* is not less than -4° and not more than -8° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of *Chenopodium* is not less than 1.4740 and not more than 1.4790 at 20° C., page 608.

Heavy metals—Oil of *Chenopodium* meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Assay—Place about 2.5 Gm. of Oil of *Chenopodium*, accurately weighed, in a 50-cc. volumetric flask, fill to the mark with 90 per cent acetic acid, mix well, and transfer a portion of this freshly prepared solution to a burette, graduated in 20ths of a cc. Into a glass-stoppered tube, about 150 mm. in length and 25 mm. in diameter, measure, from graduated pipettes, 3 cc. of a solution of potassium iodide (prepared by dissolving 8.3 Gm. of potassium iodide in sufficient distilled water to make 10 cc. of solution), 5 cc. of hydrochloric acid, and 10 cc. of glacial acetic acid. Immerse the tube in a freezing mixture until the temperature is reduced to -3° C., add about 5 cc. of the acetic acid solution of the Oil, mix it with the cooled reagent as rapidly as possible, and observe the volume drawn from the burette after 2 minutes, to allow for draining. Set the stoppered tube aside at a temperature between 5° and 10° C., then, without diluting, titrate the liberated iodine with tenth-normal sodium thiosulfate. At the same time, conduct a blank test, but dilute the reagent with 20 cc. of distilled water before titrating the liberated iodine. The difference between the two titrations represents the iodine liberated by ascaridol. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.00665 Gm. of $C_{10}H_{16}O_2$.

Storage—Preserve Oil of *Chenopodium* in tight containers and avoid exposure to excessive heat.

U. S. P. Product of Oil of *Chenopodium*—*Capsulæ Olei Chenopodii*.

AVERAGE DOSE—*Caution! As an anthelmintic for adults, single dose*, Metric, 1 cc.—Apothecaries, 15 minims.

OLEUM CINNAMOMI

Oil of Cinnamon

Oil. Cinnam.—Oil of Cassia

Oil of Cinnamon is the volatile oil distilled with steam from the leaves and twigs of *Cinnamomum Cassia* (Nees) Nees ex Blume (Fam. *Lauraceæ*), rectified by distillation. It contains not less than 80 per cent, by volume, of the total aldehydes of Oil of Cinnamon.

Description—Oil of Cinnamon is a yellowish or brownish liquid, becoming darker and thicker by age or by exposure to air, and having the characteristic odor and taste of cassia cinnamon.

Solubility—Oil of Cinnamon is soluble in an equal volume of alcohol, in 2 volumes of 70 per cent alcohol, and in an equal volume of glacial acetic acid.

Specific gravity—The specific gravity of Oil of Cinnamon is not less than 1.045 and not more than 1.063 at 25° C.

Optical rotation—The optical rotation of Oil of Cinnamon is not more than -1° and not more than $+1^{\circ}$ in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Cinnamon is not less than 1.6020 and not more than 1.6135 at 20° C., page 608.

Reaction—A solution of recently rectified Oil of Cinnamon in 70 per cent alcohol (1 in 2) is slightly acid to moistened blue litmus paper.

Heavy metals—Oil of Cinnamon meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Halogens—Rinse the interior surface of a well-cleaned, 1000-cc. beaker with successive portions of distilled water, passing the washings through a small filter until the last filtered washing, acidulated with 1 drop of nitric acid and treated with 1 drop of silver nitrate T.S., shows no turbidity. Place 3 or 4 drops of the Oil on a clean watch glass supported on a triangle, ignite the Oil, and immediately invert the moistened beaker over it. Wash the products of combustion from the sides of the beaker through the washed filter with from 10 to 20 cc. of distilled water, acidulate the filtrate with 1 drop of nitric acid, and add 1 drop of silver nitrate T.S.: the mixture does not become turbid.

Rosin or rosin oils—Shake 2 cc. of Oil of Cinnamon in a test tube with from 5 to 10 cc. of purified petroleum benzin, allow the liquids to separate, decant the benzin layer, which is but slightly colored, into another test tube, and shake it with an equal volume of cupric acetate solution (1 in 1000): the mixture does not assume a green color.

Assay for total aldehydes—Place 10 cc. of Oil of Cinnamon, measured from a pipette, in a 100-cc. cassia flask, and add 50 cc. of a saturated solution of sodium sulfite, which has been carefully rendered neutral to 2 drops of phenolphthalein T.S. by means of a 30 per cent sodium bisulfite solution. Heat the mixture in a bath containing boiling water, and shake the flask repeatedly, neutralizing the mixture from time to time by the addition of a few drops of the 30 per cent sodium bisulfite solution. When no coloration appears upon the addition of a few more drops of phenolphthalein T.S. and heating for 15 minutes, cool the mixture to room temperature, and, when the liquids have separated completely, add sufficient sodium sulfite solution to raise the lower limit of the oily layer within the graduated portion of the neck. The volume of the oily layer does not exceed 2 cc., indicating the presence in the Oil of not less than 80 per cent, by volume, of total aldehydes.

Storage—Preserve Oil of Cinnamon in well-filled, tight containers and avoid exposure to excessive heat.

U. S. P. Products of Oil of Cinnamon—Aqua Cinnamomi, Spiritus Cinnamomi.

AVERAGE DOSE—Metric, 0.1 cc.—Apothecaries, 1½ minims.

OLEUM CORIANDRI

Oil of Coriander

Ol. Coriand.—Coriander Oil

Oil of Coriander is the volatile oil distilled with steam from the dried ripe fruit of *Coriandrum sativum* Linné (Fam. *Umbelliferae*).

Description—Oil of Coriander is a colorless or pale yellow liquid, having the characteristic odor and taste of coriander.

Solubility—Oil of Coriander is soluble in 3 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Oil of Coriander is not less than 0.863 and not more than 0.875 at 25° C.

Optical rotation—The optical rotation of Oil of Coriander is not less than +8° and not more than +15° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Coriander is not less than 1.4620 and not more than 1.4720 at 20° C., page 608.

Heavy metals—Oil of Coriander meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Storage—Preserve Oil of Coriander in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM EUCALYPTI**Oil of Eucalyptus****Ol. Eucalypt.**—*Eucalyptus* Oil

Oil of Eucalyptus is the volatile oil distilled with steam from the fresh leaves of *Eucalyptus Globulus* Labillardière, or from other species of Eucalyptus (Fam. *Myrtaceæ*). It contains not less than 70 per cent of eucalyptol ($C_{10}H_{18}O$).

Description—Oil of Eucalyptus is a colorless or pale yellow liquid, having a characteristic, aromatic, somewhat camphoraceous odor, and a pungent, spicy, cooling taste.

Solubility—Oil of Eucalyptus is soluble in 5 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Oil of Eucalyptus is not less than 0.905 and not more than 0.925 at 25° C.

Congealing temperature—The congealing point of Oil of Eucalyptus is not below -15.4° C., indicating not less than 70 per cent of eucalyptol ($C_{10}H_{18}O$), page 566.

Refractive index—The refractive index of Oil of Eucalyptus is not less than 1.4580 and not more than 1.4700 at 20° C., page 608.

Reaction—A solution of recently distilled Oil of Eucalyptus in 70 per cent alcohol (1 in 5) is neutral to moistened litmus paper.

Heavy metals—Oil of Eucalyptus meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Phellandrene—Mix 2.5 cc. of Oil of Eucalyptus with 5 cc. of purified benzin, add 5 cc. of a solution of sodium nitrite made by dissolving 5 Gm. of sodium nitrite in 8 cc. of distilled water, then gradually add 5 cc. of glacial acetic acid: no crystals form in the mixture within 10 minutes.

Storage—Preserve Oil of Eucalyptus in tight containers.

AVERAGE DOSE—Metric, 0.5 cc.—Apothecaries, 8 minims.

OLEUM FÆNICULI**Oil of Fennel****Ol. Fœnic.**—Fennel Oil

Oil of Fennel is the volatile oil distilled with steam from the dried ripe fruit of *Fœniculum vulgare* Miller (Fam. *Umbelliferæ*).

Note—If solid material has separated, carefully warm the Oil at a low temperature until it is completely liquefied and thoroughly mix it before using.

Description—Oil of Fennel is a colorless or pale yellow liquid, having the characteristic odor and taste of fennel.

Solubility—Oil of Fennel is soluble in 8 volumes of 80 per cent alcohol and in 1 volume of 90 per cent alcohol.

Specific gravity—The specific gravity of Oil of Fennel is not less than 0.953 and not more than 0.973 at 25° C.

Congealing temperature—The congealing point of Oil of Fennel is not below 3° C., page 566.

Optical rotation—The optical rotation of Oil of Fennel is not less than +12° and not more than +24° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Fennel is not less than 1.5280 and not more than 1.5380 at 20° C., page 608.

Heavy metals—Oil of Fennel meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Reaction—A solution of recently distilled Oil of Fennel in 80 per cent alcohol (1 in 8) is neutral to moistened litmus paper.

Storage—Preserve Oil of Fennel in tight containers.

U. S. P. Product of Oil of Fennel—Aqua Fœniculi.

OLEUM GOSSYPHII SEMINIS

Cottonseed Oil

Ol. Gossyp. Sem.—Cotton Seed Oil

Cottonseed Oil is the refined, fixed oil obtained from the seed of cultivated plants of various varieties of *Gossypium hirsutum* Linné or of other species of *Gossypium* (Fam. *Malvaceæ*).

Description—Cottonseed Oil is a pale yellow, oily liquid. It is odorless or nearly so, and has a bland taste.

Solubility—Cottonseed Oil is slightly soluble in alcohol. It is miscible with ether, chloroform, purified benzin, and with carbon disulfide.

Specific gravity—The specific gravity of Cottonseed Oil is not less than 0.915 and not more than 0.921 at 25° C.

Congeaing temperature—At temperatures below 12° C. particles of solid fat separate from the Cottonseed Oil, and at about 0° C. to -5° C. the Oil becomes solid or nearly so.

Identification—

A: Dilute Cottonseed Oil with an equal volume of carbon disulfide, and add sulfuric acid (specific gravity 1.6 to 1.7): the mixture rapidly becomes reddish brown in color.

B: Mix 2 cc. of Cottonseed Oil in a test tube with 2 cc. of a mixture of equal volumes of amyl alcohol and a 1 per cent solution of precipitated sulfur in carbon disulfide. Warm the mixture carefully until the carbon disulfide is expelled, and immerse the test tube to one-third of its length in a boiling, saturated aqueous solution of sodium chloride: a red color develops in the mixture within 5 to 15 minutes.

Saponification value—The saponification value of Cottonseed Oil is not less than 190 and not more than 198, page 579.

Iodine value—The iodine value of Cottonseed Oil is not less than 105 and not more than 114, page 579.

Solidification temperature of the fatty acids—The dry, mixed fatty acids of Cottonseed Oil solidify at a temperature not below 28° and not above 35° C., page 577.

Storage—Preserve Cottonseed Oil in tight containers.

OLEUM HIPPOGLOSSI

Halibut Liver Oil

Ol. Hippoglos.

Halibut Liver Oil is the fixed oil obtained from the fresh, or suitably preserved livers of *Hippoglossus hippoglossus* Linné (Fam. *Pleuronectidæ*). Halibut Liver Oil contains in each Gm. not less than 60,000

U. S. P. Units of Vitamin A and not less than 600 U. S. P. Units of Vitamin D.

The Vitamin A potency and Vitamin D potency of Halibut Liver Oil, when designated on the label, shall be expressed in "United States Pharmacopœia Units" per Gm. of oil and may be referred to as "U. S. P. Units."

Halibut Liver Oil may be flavored by the addition of not more than 1 per cent of any one or any mixture of flavoring substances recognized in this Pharmacopœia.

Description—Halibut Liver Oil is a yellow to brownish yellow, oily liquid, and has a characteristic, slightly fishy, but not a rancid, odor, and a fishy taste.

Solubility—Halibut Liver Oil is insoluble in water. It is slightly soluble in alcohol, but is freely soluble in ether, in chloroform, in carbon disulfide, and in ethyl acetate.

Specific gravity—The specific gravity of Halibut Liver Oil is between 0.920 and 0.930 at 25° C.

Identification—A solution of 1 drop of Halibut Liver Oil in 1 cc. of chloroform, when shaken with 1 drop of sulfuric acid, acquires a blue color, changing to violet then to dark green and finally to brown.

Free fatty acids—Dissolve 2 Gm. of Halibut Liver Oil in 20 cc. of a mixture of equal volumes of alcohol and ether, which has been previously neutralized with tenth-normal sodium hydroxide, add 5 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking for 15 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Unsaponifiable matter—The unsaponifiable matter of Halibut Liver Oil is not less than 7 per cent and not more than 13.5 per cent, page 580.

Saponification value—The saponification value of Halibut Liver Oil is not less than 160 and not more than 180, page 579.

Iodine value—The iodine value of Halibut Liver Oil, using from 0.18 to 0.20 Gm. of Oil, accurately weighed, is not less than 125 and not more than 155, page 579.

Assay—Proceed as directed under *Vitamins A and D Assays*, page 635.

Storage—Preserve Halibut Liver Oil in tight containers. Halibut Liver Oil may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

U. S. P. Product of Halibut Liver Oil—Capsulæ Olei Hippoglossi.

AVERAGE DAILY DOSE—Prophylactic, infants and adults,
Metric, 0.1 cc.—Apothecaries, 1½ minims.

NOTE—Halibut Liver Oil containing more than the minimum U. S. P. requirement for vitamin A may be administered in proportionally smaller doses.

OLEUM IODATUM

Iodized Oil

Ol. Iodat.

Iodized Oil is an iodine addition product of vegetable oils, containing not less than 38 per cent and not more than 42 per cent of organically combined iodine (I).

Description—Iodized Oil is a thick, viscous, oily liquid, having an alliaceous odor and an oleaginous taste. Iodized Oil decomposes on exposure to air and sunlight, becoming dark brown in color.

Solubility—Mix 1 cc. of Iodized Oil with 10 cc. of purified benzin: a clear solution results.

Identification—Mix 0.2 cc. of Iodized Oil with 1 Gm. of anhydrous sodium carbonate in a small porcelain crucible, cover it with 1 Gm. of anhydrous sodium carbonate, well pressed down, and heat the crucible rapidly and strongly for 10 minutes. Allow the crucible and contents to cool, and dissolve the residue in 20 cc. of hot distilled water. Filter the solution, and add hydrochloric acid cautiously until effervescence ceases. Place 10 cc. of the solution in a test tube, and add 2 cc. of chloroform and a few drops of chlorine T.S.: upon being shaken, the chloroform layer becomes violet colored.

Ash—Iodized Oil yields not more than 0.1 per cent of ash, page 556.

Free acid—Dissolve 1 cc. of Iodized Oil in 10 cc. of chloroform in a glass-stoppered cylinder, add 3 drops of phenolphthalein T.S. and 0.3 cc. of tenth-normal sodium hydroxide, stopper, and shake the mixture vigorously: the mixture becomes red.

Assay for iodine—Mix about 0.35 Gm. of Iodized Oil, accurately weighed, with 2 Gm. of anhydrous sodium carbonate in a small crucible, and completely fill the crucible with anhydrous sodium carbonate well pressed down; invert the crucible and contents in a larger crucible, and add sufficient anhydrous sodium carbonate to seal the junction of the two crucibles. Heat rapidly and strongly in a muffle furnace, and maintain the crucibles and mass at dull redness for 20 minutes. Allow the crucibles and contents to cool, and dissolve the residue in 100 cc. of hot distilled water in a beaker. Filter the hot solution into a 500-cc. flask, and wash the beaker, crucibles, and filter with three 10-cc. portions of hot distilled water. Allow the filtrate and washings to cool, and add hydrochloric acid cautiously until effervescence ceases, then add an equal volume of hydrochloric acid, and titrate with twentieth-molar potassium iodate, shaking vigorously, until the dark brown solution which is formed becomes light brown; add 5 cc. of chloroform, and continue the titration until the chloroform becomes colorless and the supernatant liquid is clear yellow. One cc. of twentieth-molar potassium iodate is equivalent to 0.01269 Gm. of I.

Storage—Preserve Iodized Oil in well-filled, tight, light-resistant containers.

OLEUM JUNIPERI

Oil of Juniper

Ol. Junip.—Juniper Oil

Oil of Juniper is the volatile oil distilled with steam from the dried ripe fruit of *Juniperus communis* Linné (Fam. *Pinaceæ*).

Description—Oil of Juniper is a colorless or faintly green or yellow liquid, having the characteristic odor and taste of juniper berries.

Solubility—Oil of Juniper is soluble in 4 volumes of alcohol with either cloudiness or turbidity, and when diluted to 10 volumes, shows no separation of oily globules after standing for 12 hours.

Specific gravity—The specific gravity of Oil of Juniper is not less than 0.854 and not more than 0.879 at 25° C.

Optical rotation—The optical rotation of Oil of Juniper varies from 0° to not more than -15° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Juniper is not less than 1.4740 and not more than 1.4840 at 20° C., page 608.

Reaction—A solution of recently distilled Oil of Juniper in alcohol (1 in 4) is neutral or only slightly acid to moistened litmus paper.

Heavy metals—Oil of Juniper meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Storage—Preserve Oil of Juniper in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM LAVANDULÆ

Oil of Lavender

Ol. Lavand.—Oil of Lavender Flowers

Oil of Lavender is the volatile oil distilled with steam from the fresh flowering tops of *Lavandula officinalis* Chaix ex Villars (*Lavandula vera* DeCandolle) (Fam. *Labiata*). It contains not less than 30 per cent of esters calculated as linalyl acetate ($C_{10}H_{17} \cdot C_2H_3O_2$).

Description—Oil of Lavender is a colorless or yellow liquid, having the characteristic odor and taste of lavender flowers.

Solubility—Oil of Lavender is soluble in 4 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Oil of Lavender is not less than 0.875 and not more than 0.888 at 25° C.

Optical rotation—The optical rotation of Oil of Lavender is not less than -3° and not more than -10° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Lavender is not less than 1.4590 and not more than 1.4700 at 20° C., page 608.

Alcohol—Shake 5 cc. of Oil of Lavender with an equal volume of distilled water in a narrow, graduated, 10-cc. glass-stoppered cylinder: the volume of the oil does not diminish.

Esters—Shake 20 cc. of Oil of Lavender with 40 cc. of 5 per cent alcohol in a 100-cc., glass-stoppered cylinder. When the mixture has cleared, withdraw 30 cc. of the alcoholic solution, by means of a pipette, and place it in a 125-cc. Erlenmeyer flask. Neutralize the solution with half-normal potassium hydroxide, using 2 drops of phenolphthalein T.S. as the indicator; add exactly 5 cc. of half-normal potassium hydroxide, and heat the mixture on a bath of boiling water under a reflux condenser during 1 hour. Allow the mixture to cool, remove the flask from the bath, and titrate the excess of alkali with half-normal hydrochloric acid: not less than 4.7 cc. of the acid is required for neutralization.

Assay—Proceed as directed for esters under *Oleum Mentha Piperitæ*, using 5 cc. of Oil of Lavender, accurately weighed, and 50 cc. of half-normal alcoholic potassium hydroxide. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09814, indicates the number of Gm. of esters, calculated as linalyl acetate ($C_{10}H_{17} \cdot C_2H_3O_2$), in the Oil taken for assay.

Storage—Preserve Oil of Lavender in tight containers.

U. S. P. Products of Oil of Lavender—*Spiritus Lavandulæ*, *Tinctura Lavandulæ Composita*.

OLEUM LIMONIS

Oil of Lemon

Ol. Limon.—Lemon Oil

Oil of Lemon is the volatile oil obtained by expression, without the aid of heat, from the fresh peel of the fruit of *Citrus Medica* Linné var.

Limon Linné (Fam. *Rutaceæ*), with or without the previous separation of the pulp and the peel.

Note—Oil of Lemon which has a terebinthinate odor must not be used or dispensed.

Description—Oil of Lemon is a pale yellow to deep yellow or greenish yellow liquid, having the characteristic odor and taste of the outer part of fresh lemon peel.

Solubility—Oil of Lemon is soluble in 3 volumes of alcohol, and in all proportions in dehydrated alcohol, in carbon disulfide, and in glacial acetic acid.

Specific gravity—The specific gravity of Oil of Lemon is not less than 0.849 and not more than 0.855 at 25° C.

Optical rotation—The optical rotation of Oil of Lemon is not less than +57° and not more than +65.6° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Lemon is not less than 1.4742 and not more than 1.4755 at 20° C., page 608.

Reaction—A solution of recently expressed Oil of Lemon in alcohol (1 in 3) is neutral or only slightly acid to moistened litmus paper.

Foreign oils—When distilled as described under *Oleum Aurantii*, page 316, Oil of Lemon gives the following results: the angle of optical rotation of the first 5 cc. is not more than 5 degrees less than that of the original Oil. The refractive index of this same portion is not less than 0.0010 and not more than 0.0027 lower than that of the original Oil.

Storage—Preserve Oil of Lemon in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM LINI

Linseed Oil

Oil. Lini—Oil of Flaxseed, Raw Linseed Oil

Linseed Oil is the fixed oil obtained from linseed.

Note—Linseed Oil that has been “boiled” or treated with a drier must not be used or dispensed.

Description—Linseed Oil is a yellow, oily liquid, having a characteristic odor and a bland taste. When exposed to air, it gradually thickens, darkens in color, and acquires a more pronounced odor and taste.

Solubility—Linseed Oil is slightly soluble in alcohol, but is miscible with ether, chloroform, petroleum benzin, carbon disulfide, and with oil of turpentine.

Specific gravity—The specific gravity of Linseed Oil is not less than 0.925 and not more than 0.935 at 25° C.

Non-drying oils—Linseed Oil, when spread in a thin layer on a glass plate and allowed to stand in a warm place protected from dust, is gradually converted into a hard, transparent film.

Mineral or rosin oils—To 10 cc. of Linseed Oil add 3 Gm. of potassium hydroxide, 10 cc. of alcohol, and 10 cc. of distilled water, and heat the mixture on a water bath with frequent agitation until a clear solution results: the addition of 100 cc. of distilled water to this solution yields a clear liquid free from oily drops.

Rosin or rosin oils—Warm 10 cc. of Linseed Oil with an equal volume of acetic anhydride in a test tube until solution is effected. Allow the mixture to cool, then separate the lower anhydride layer, and filter it through a small filter moistened with acetic anhydride. Place 2 or 3 drops of the filtrate on a white porcelain surface, and add 1 drop of sulfuric acid: no violet color is produced.

Unsaponifiable matter—Linseed Oil contains not more than 1.5 per cent of unsaponifiable matter, page 580.

Saponification value—The saponification value of Linseed Oil is not less than 187 and not more than 195, page 579.

Iodine value—The iodine value of Linseed Oil is not less than 170, page 579.

Acid value—The free fatty acids in 10 Gm. of Linseed Oil require for neutralization not more than 7.5 cc. of tenth-normal sodium hydroxide, page 578.

Storage—Preserve Linseed Oil in tight containers.

OLEUM MENTHÆ PIPERITÆ

Oil of Peppermint

Ol. Menth. Pip.—Peppermint Oil

Oil of Peppermint is the volatile oil distilled with steam from the fresh over-ground parts of the flowering plant of *Mentha piperita* Linné (Fam. *Labiatae*), rectified by distillation and neither partially nor wholly dementholized. It yields not less than 5 per cent of esters, calculated as menthyl acetate ($C_{10}H_{19}.C_2H_3O_2$), and not less than 50 per cent of total menthol ($C_{10}H_{19}.OH$), free and as esters.

Description—Oil of Peppermint is a colorless liquid, having a strong, penetrating odor of peppermint, and a pungent taste, followed by a sensation of cold when air is drawn into the mouth.

Specific gravity—The specific gravity of Oil of Peppermint is not less than 0.896 and not more than 0.908 at 25° C.

Optical rotation—The optical rotation of Oil of Peppermint is not less than -18° and not more than -32° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Peppermint is not less than 1.4590 and not more than 1.4650 at 20° C., page 608.

Reaction—A solution of recently rectified Oil of Peppermint in 70 per cent alcohol (1 in 3) is neutral to moistened litmus paper.

Dementholized or impure peppermint oil—Oil of Peppermint is clearly soluble in 3 volumes of 70 per cent alcohol, by volume, showing no separation of oil globules.

Dimethyl sulfide found in unrectified peppermint oils—Distil 1 cc. from 25 cc. of Oil of Peppermint, and carefully superimpose the distillate on 5 cc. of mercuric chloride T.S. in a test tube: a white film does not form at the zone of contact within 1 minute.

Distinction from oil of *Mentha arvensis*—Prepare a 2 per cent solution of freshly redistilled aniline in glacial acetic acid. Add 5 cc. of this solution to 0.1 cc. of Oil of Peppermint in a test tube. Shake well and allow the contents to stand for 5 minutes. If oil from *Mentha arvensis* is present, the mixture will turn pink, but if no oil from *Mentha arvensis* is present, the color will remain pale yellow.

Assay for esters—Place 10 cc. of Oil of Peppermint in a tared, 125-cc. Erlenmeyer flask, and weigh it accurately. Add 25 cc. of half-normal alcoholic potassium hydroxide, connect the flask with a reflux condenser, and boil the mixture on a water bath for exactly 1 hour. Allow the mixture to cool, and titrate the excess of alkali with half-normal sulfuric acid, using 10 drops of phenolphthalein T.S. as the indicator. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09915, indicates the number of Gm. of esters, calculated as menthyl acetate, in the Oil taken for the assay.

Assay for total menthol—Place 10 cc. of Oil of Peppermint in an acetylation flask of 100-cc. capacity, and add 10 cc. of acetic anhydride and 1 Gm. of anhydrous sodium acetate. Boil the mixture gently for exactly 1 hour, cool, disconnect the flask from the condenser, transfer the mixture to a small separator, rinsing the acetylation flask with three successive, 5-cc. portions of warm distilled water, and add the

rinsings to the separator. When the liquids have completely separated, reject the aqueous layer, and wash the remaining oil with successive portions of sodium carbonate T.S., diluted with an equal volume of distilled water, until the last washing is alkaline to 2 drops of phenolphthalein T.S. Dry the resulting oil with anhydrous sodium sulfate and filter. Transfer 5 cc. of the dry acetylated oil to a tared, 100-cc. Erlenmeyer flask, note its exact weight, add 50 cc. of half-normal alcoholic potassium hydroxide, connect the flask with a reflux condenser, and boil the mixture on a water bath for exactly 1 hour. Allow the mixture to cool, and titrate the excess of alkali with half-normal sulfuric acid, using 10 drops of phenolphthalein T.S. as the indicator. Calculate the per cent of menthol by the following formula:

Per cent of total menthol in the Oil tested = $\frac{A \times 7.813}{B - (A \times 0.021)} \times [1 - (E \times 0.0021)]$.

A is the result obtained by subtracting the number of cc. of half-normal sulfuric acid required in the above titration from the number of cc. of half-normal alcoholic potassium hydroxide originally taken, *B* is the weight of acetylated oil taken, and *E* is the percentage of esters calculated as menthyl acetate ($C_{10}H_{19}-C_2H_3O_2$).

Storage—Preserve Oil of Peppermint in tight containers.

U. S. P. Products of Oil of Peppermint—Aqua Menthae Piperitæ, Spiritus Menthae Piperitæ.

OLEUM MENTHÆ VIRIDIS

Oil of Spearmint

Ol. Menth. Vir.—Spearmint Oil .

Oil of Spearmint is the volatile oil distilled with steam from the fresh, over-ground parts of the flowering plant of *Mentha spicata* Linné (*Mentha viridis* Linné) (Fam. *Labiata*). It yields not less than 50 per cent, by volume, of carvone ($C_{10}H_{14}O$).

Description—Oil of Spearmint is a colorless, yellow or greenish yellow liquid, having the characteristic odor and taste of spearmint.

Solubility—Oil of Spearmint is soluble in one volume of 80 per cent alcohol, forming a clear solution.

Specific gravity—The specific gravity of Oil of Spearmint is not less than 0.917 and not more than 0.934 at 25° C.

Optical rotation—The optical rotation of Oil of Spearmint is not less than -48° and not more than -59° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Spearmint is not less than 1.4840 and not more than 1.4910 at 20° C., page 608.

Reaction—A solution of recently distilled Oil of Spearmint in an equal volume of 80 per cent alcohol is neutral or only slightly acid to moistened litmus paper.

Assay—Place 10 cc. of Oil of Spearmint, measured from a pipette, in a 100-cc. cassia flask, and add 50 cc. of a saturated solution of sodium sulfite, which has been carefully rendered neutral to 2 drops of phenolphthalein T.S. by means of a 30 per cent sodium bisulfite solution. Heat the mixture in a bath containing boiling water, and shake the flask repeatedly, neutralizing the mixture from time to time by the addition of a few drops of the 30 per cent sodium bisulfite solution. When no coloration appears upon the addition of a few more drops of phenolphthalein T.S. and heating for 15 minutes, cool to room temperature, and when the liquids

have separated completely, add sufficient of the sodium sulfite solution to raise the lower limit of the oily layer within the graduated portion of the neck. The oily layer measures not more than 5 cc., indicating the presence in the Oil of not less than 50 per cent, by volume, of carvone ($C_{10}H_{14}O$).

Storage—Preserve Oil of Spearmint in tight containers.

U. S. P. Products of Oil of Spearmint—Aqua Menthae Viridis, Spiritus Menthae Viridis.

OLEUM MORRHUÆ

Cod Liver Oil

Ol. Morrh.

Cod Liver Oil is the partially destearinated fixed oil obtained from fresh livers of *Gadus morrhua* Linné and other species of the Family *Gadidæ*. Cod Liver Oil contains in each Gm. not less than 850 U. S. P. Units of Vitamin A and not less than 85 U. S. P. Units of Vitamin D.

The Vitamin A potency and Vitamin D potency of Cod Liver Oil, when designated on the label, shall be expressed in "United States Pharmacopœia Units" per Gm. of oil and may be referred to as "U. S. P. Units."

Cod Liver Oil may be flavored by the addition of not more than 1 per cent of any one or any mixture of flavoring substances recognized in this Pharmacopœia.

Description—Cod Liver Oil is a thin, oily liquid, and has a characteristic, slightly fishy, but not a rancid, odor, and a fishy taste.

Solubility—Cod Liver Oil is slightly soluble in alcohol, but is freely soluble in ether, in chloroform, in carbon disulfide, and in ethyl acetate.

Specific gravity—The specific gravity of Cod Liver Oil is not less than 0.918 and not more than 0.927 at 25° C.

Color—When viewed transversely in a tall, cylindrical, standard oil-sample bottle of colorless glass of about 120-cc. capacity, the color of Cod Liver Oil shall not be more intense than that of a mixture of 11 cc. of cobaltous chloride C.S., 76 cc. of ferric chloride C.S. and 33 cc. of distilled water, in a similar bottle of the same internal diameter.

Undestearinated cod liver oil—Fill a tall, cylindrical, standard oil-sample bottle of about 120-cc. capacity with Cod Liver Oil at a temperature between 23° and 28° C., stopper, and immerse the bottle in a mixture of ice and distilled water for 3 hours: the oil remains clear and does not deposit stearin.

Unsaponifiable matter—Cod Liver Oil contains not more than 1.3 per cent of unsaponifiable matter, page 580.

Saponification value—The saponification value of Cod Liver Oil is not less than 180 and not more than 192, page 579. When carbon dioxide has been used as a preservative, the Oil must be exposed in a shallow dish in a vacuum desiccator for 24 hours before weighing the sample for determination of the saponification value.

Iodine value—The iodine value of Cod Liver Oil is not less than 145 and not more than 180, page 579.

Acid value—Dissolve 2 Gm. of Cod Liver Oil, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator. Boil the oil solution gently under a reflux condenser for 10 minutes, cool, and titrate the mixture with tenth-normal sodium hydroxide

to the production of a pink color which persists after shaking for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Spectrophotometric absorption value—When examined spectrophotometrically in comparison with the U. S. P. Cod Liver Oil Reference Standard, the absorption value at 3280 Angström units of an unknown oil (absorption for any concentration of solution is here defined as $\log \frac{I_0}{I}$ where I_0 is the light incident upon the solution and I is the light transmitted through the solution) shall be not less than 95 per cent of $\frac{850}{\text{Reference oil potency}} \times \text{Reference oil absorption}$ when both the absorption of the reference oil and oil in question are calculated to the same per cent concentration and for the same absorption cell or practically identical absorption cells.

Absorption at 3280 Angström units of a per cent of unknown oil must equal or exceed

$$\frac{0.95 \times 850}{\text{Potency of reference oil}} \times \text{Absorption of a per cent of reference oil.}$$

Assay—Proceed as directed under *Vitamins A and D Assays*, page 635.

Storage—Preserve Cod Liver Oil in tight containers. Cod Liver Oil may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

U. S. P. Product of Cod Liver Oil—Emulsum Olei Morrhue.

AVERAGE DAILY DOSE—Infants and adults, Metric, 8 cc.—
Apothecaries, 2 fluidrachms.

NOTE—Cod liver Oil containing more than the minimum U. S. P. requirements for both vitamin A and vitamin D may be administered in proportionally smaller doses.

OLEUM MORRHUÆ NON-DESTEARINATUM

Non-destearinated Cod Liver Oil

Ol. Morrh. Non-Destearin.

Non-destearinated Cod Liver Oil is the entire fixed oil obtained from fresh livers of *Gadus morrhua* Linné and other species of the Family *Gadidae*, containing not more than 0.5 per cent by volume of water and liver tissue. Non-destearinated Cod Liver Oil contains in each Gm. at least 850 U. S. P. Units of Vitamin A and at least 85 U. S. P. Units of Vitamin D.

The Vitamin A potency and Vitamin D potency of Non-destearinated Cod Liver Oil when designated shall be expressed in "United States Pharmacopœia Units" per gram of oil; these units may be referred to as "U. S. P. Units."

Description—Non-destearinated Cod Liver Oil is a thin, oily liquid at normal room temperature, and has a characteristic, slightly fishy, but not a rancid odor, and a fishy taste. Non-destearinated Cod Liver Oil congeals or deposits stearin upon chilling.

Solubility—Non-destearinated Cod Liver Oil is slightly soluble in alcohol, but it is freely soluble in ether and in chloroform.

Water and sediment—Non-destearinated Cod Liver Oil contains not more than 0.5 per cent by volume of water and sediment, page 580.

Iodine value—The iodine value of Non-destearinated Cod Liver Oil is not less than 128 and not more than 180, page 579.

Other requirements—In addition to the herein specified requirements, Non-destearinated Cod Liver Oil satisfies the requirements of the test for *color, unsaponifiable matter, saponification value, free fatty acids* and for *spectrophotometric absorption value* under *Oleum Morrhuae*, page 329.

Assay—Proceed as directed under *Oleum Morrhuae*, page 329.

Storage—Preserve Non-destearinated Cod Liver Oil in tight containers. It may be stored in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

OLEUM MYRISTICÆ

Oil of Myristica

Ol. Myrist.—Myristica Oil, Oil of Nutmeg

Oil of Myristica is the volatile oil distilled with steam from the dried kernels of the ripe seed of *Myristica fragrans* Houttuyn (Fam. *Myristicaceæ*).

Description—Oil of Myristica is a colorless or pale yellow liquid, having the characteristic odor and taste of nutmeg.

Solubility—Oil of Myristica is soluble in an equal volume of alcohol and in 3 volumes of 90 per cent alcohol.

Specific gravity—The specific gravity of Oil of Myristica is not less than 0.880 and not more than 0.910 at 25° C.

Optical rotation—The optical rotation of Oil of Myristica is not less than +10° and not more than +30° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Myristica is not less than 1.4740 and not more than 1.4880 at 20° C., page 608.

Residue—Evaporate 3 Gm. of Oil of Myristica in a small tared dish on a water bath: the weight of the residue does not exceed 0.06 Gm.

Reaction—A solution of recently distilled Oil of Myristica in an equal volume of alcohol is neutral or only slightly acid to moistened litmus paper.

Storage—Preserve Oil of Myristica in tight containers.

OLEUM OLIVÆ

Olive Oil

Ol. Oliv.—Sweet Oil

Olive Oil is the fixed oil obtained from the ripe fruit of *Olea europæa* Linné (Fam. *Oleaceæ*).

Description—Olive Oil is a pale yellow, or light greenish yellow, oily liquid, having a slight, characteristic odor and taste, with a faintly acid after-taste.

Solubility—Olive Oil is slightly soluble in alcohol. It is miscible with ether, with chloroform, and with carbon disulfide.

Specific gravity—The specific gravity of Olive Oil is not less than 0.910 and not more than 0.915 at 25° C.

Cottonseed oil—Mix 5 cc. of Olive Oil in a test tube with 5 cc. of a mixture of equal volumes of amyl alcohol and a 1 per cent solution of precipitated sulfur in carbon disulfide, warm the mixture carefully until the carbon disulfide is expelled, and immerse the test tube to one-third of its length in a boiling, saturated aqueous solution of sodium chloride: the mixture develops no reddish color within 2 hours.

Peanut oil—Saponify 10 Gm. of Olive Oil by heating it for 1 hour under a reflux condenser with a solution of 4 Gm. of potassium hydroxide in 80 cc. of alcohol. Neutralize exactly with diluted acetic acid, using phenolphthalein T.S. as the indicator, and wash into 120 cc. of boiling lead acetate T.S. Boil the mixture for 1 minute, and cool by immersing the flask in cold water, occasionally rotating the contents to cause the precipitate to adhere to the sides of the flask. Decant the liquid, wash the precipitate with cold water to remove the excess of lead acetate, and then wash with 90 per cent alcohol (by volume). Add 100 cc. of ether, stopper the flask well, and allow it to stand until the precipitate is disintegrated. Connect with a reflux condenser, boil for 5 minutes, cool to about 15° C., and allow it to stand over night. Filter, and thoroughly wash the precipitate of lead soaps with ether. Wash the precipitate into a 500-cc. separator by means of a jet of ether, alternating with diluted hydrochloric acid at the end if a little of the precipitate adheres to the filter paper. Add enough diluted hydrochloric acid to make the total acid layer measure about 100 cc., and enough ether to make the total ether layer measure about 100 cc., and shake the mixture vigorously for several minutes. Allow the layers to separate, draw off the acid layer, and wash the ether once by shaking with 50 cc. of diluted hydrochloric acid and then with several portions of distilled water until the last washing is not acid to methyl orange T.S. Transfer the ether solution to a dry flask, evaporate the ether, add a little dehydrated alcohol, and evaporate on a water bath. Dissolve the dry fatty acids by warming with 60 cc. of 90 per cent alcohol, by volume, slowly cool the solution to 15° C., shaking frequently to aid crystallization, and allow the mixture to stand at 15° C. for 30 minutes: no crystals separate from the mixture.

Sesame oil—Mix 10 cc. of Olive Oil with 10 cc. of hydrochloric acid, add 0.1 cc. of an alcoholic solution of furfural (1 in 50), and shake the mixture vigorously for 15 seconds: no pink to crimson color appears in the acid layer when the emulsion breaks. Should any color appear in the acid layer, add 10 cc. of distilled water, and again shake the mixture vigorously. In the absence of sesame oil the pink color is fugitive.

Teaseed oil—In a dry test tube of approximately 18 × 150 mm. place 0.8 cc. of acetic anhydride, 1.5 cc. of chloroform, and 0.2 cc. of sulfuric acid. Mix, and cool in a water bath to 25° C. Add 7 drops of Olive Oil (approximately 0.2 Gm.), mix well, and cool again to 25° C. If the solution is cloudy, add acetic anhydride, drop by drop, shaking after each addition, until the solution suddenly clears. Allow the mixture to remain in the water bath for 5 minutes: it shows a green color by both reflected and transmitted light. Add 10 cc. of anhydrous ether, and mix by inverting the tube. The initial green color fades to a brownish gray. Before diluting with the ether, *teaseed oil* will cause a brown color to appear by transmitted light, and after diluting, a transient red color.

Saponification value—The saponification value of Olive Oil is not less than 190 and not more than 195, page 579.

Iodine value—The iodine value of Olive Oil is not less than 79 and not more than 88, page 579.

Acid value—The free fatty acids in 10 Gm. of Olive Oil require for neutralization not more than 5 cc. of tenth-normal sodium hydroxide, page 578.

Solidification temperature of fatty acids—The solidifying temperature of the mixed fatty acids of Olive Oil is not below 17° C. and not above 26° C., page 577.

Storage—Preserve Olive Oil in tight containers.

AVERAGE DOSE—Metric, 30 cc.—Apothecaries, 1 fluidounce.

OLEUM PERSICÆ

Persic Oil

Ol. Persic.—Apricot Kernel Oil, Peach Kernel Oil

Persic Oil is the oil expressed from the kernels of varieties of *Prunus Armeniaca* Linné (Fam. *Rosaceæ*) (Apricot Kernel Oil), or from the kernels of varieties of *Prunus Persica* Sieb. et Zucc. (Fam. *Rosaceæ*) (Peach Kernel Oil).

Persic Oil must be labeled to indicate whether it was derived from apricot kernels or from peach kernels.

Description—Persic Oil is a clear, pale straw-colored or colorless, oily liquid. It is almost odorless, and has a bland taste.

Solubility—Persic Oil is slightly soluble in alcohol, but is miscible with ether, chloroform, benzene, and purified benzin.

Specific gravity—The specific gravity of Persic Oil is not less than 0.910 and not more than 0.918 at 25° C.

Mineral oil—Heat on a water bath 10 cc. of Persic Oil with 15 cc. of an aqueous solution of sodium hydroxide (1 in 6) and 30 cc. of alcohol in a flask having a small, short-stemmed funnel inserted in the neck, and occasionally agitate the mixture until it becomes clear. Transfer the solution to a shallow dish, evaporate the alcohol on a water bath, and mix the residue with 100 cc. of distilled water: a clear solution results.

Other oils—Persic Oil meets the requirements of the tests for *cottonseed oil* and for *sesame oil* under *Oleum Olivæ*, page 331.

Saponification value—The saponification value of Persic Oil is not less than 185 and not more than 195, page 579.

Iodine value—The iodine value of Persic Oil is not less than 90 and not more than 108, page 579.

Solidification temperature—Persic Oil is not turbid at temperatures above 15° C., page 579.

Storage—Preserve Persic Oil in tight containers.

OLEUM PICIS RECTIFICATUM

Rectified Oil of Tar

Ol. Pic. Rect.—Oleum Picis Liquidæ Rectificatum

Rectified Oil of Tar is the volatile oil from pine tar rectified by steam distillation.

Description—Rectified Oil of Tar is a thin liquid, having a dark reddish brown color, and a strong, empyreumatic odor and taste.

Solubility—Rectified Oil of Tar is miscible in all proportions in alcohol.

Specific gravity—The specific gravity of Rectified Oil of Tar is not less than 0.960 and not more than 0.990 at 25° C.

Reaction—An alcoholic solution of Rectified Oil of Tar is acid to moistened blue litmus paper.

Storage—Preserve Rectified Oil of Tar in tight containers.

U. S. P. Product of Rectified Oil of Tar—Syrupus Picis Pini.

OLEUM PINI PUMILIONIS

Oil of Dwarf Pine Needles

Ol. Pin. Pumil.—Pine Needle Oil

Oil of Dwarf Pine Needles is the volatile oil distilled with steam from the fresh leaves of *Pinus Mugo* Turra (*Pinus Pumilio* Haenke) (Fam. *Pinaceæ*). It contains not less than 4 per cent of esters calculated as bornyl acetate ($C_{10}H_{17} \cdot C_2H_3O_2$).

Description—Oil of Dwarf Pine Needles is a colorless or faintly yellowish liquid, having a pleasant, aromatic odor, and a bitter, pungent taste.

Solubility—Oil of Dwarf Pine Needles is soluble in from 4.5 to 8 volumes of 90 per cent alcohol.

Specific gravity—The specific gravity of Oil of Dwarf Pine Needles is not less than 0.853 and not more than 0.869 at 25° C.

Optical rotation—The optical rotation of Oil of Dwarf Pine Needles is not less than -5° and not more than -15° in a 100-mm. tube at 25° C., page 601.

Distillation limits—Less than 4 per cent of Oil of Dwarf Pine Needles distills below 165° C., page 559.

Assay—Proceed as directed for the determination of esters under *Oleum Menthe Piperitæ*, page 327, using 10 cc. of Oil of Dwarf Pine Needles. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09814, indicates the number of Gm. of esters, calculated as bornyl acetate, in the amount of Oil taken for the assay.

Storage—Preserve Oil of Dwarf Pine Needles in tight containers.

OLEUM RICINI

Castor Oil

Ol. Ricin.

Castor Oil is the fixed oil obtained from the seed of *Ricinus communis* Linné (Fam. *Euphorbiaceæ*).

Description—Castor Oil is a pale yellowish or almost colorless, transparent, viscid liquid. It has a faint, mild odor, and a bland, afterwards slightly acid and usually nauseating taste.

Solubility—Castor Oil is soluble in alcohol and is miscible with dehydrated alcohol and with glacial acetic acid, chloroform, and ether.

Specific gravity—The specific gravity of Castor Oil is not less than 0.945 and not more than 0.965 at 25° C.

Distinction from most other fixed oils—Castor Oil is only partly soluble in purified benzin (*most other fixed oils*), but it yields a clear liquid with an equal volume of alcohol (*foreign fixed oils*).

Saponification value—The saponification value of Castor Oil is not less than 179 and not more than 185, page 579.

Iodine value—The iodine value of Castor Oil is not less than 83 and not more than 88, page 579.

Acid value—The free fatty acids in 10 Gm. of Castor Oil require for neutralization not more than 7.5 cc. of tenth-normal sodium hydroxide, page 578.

Storage—Preserve Castor Oil in tight containers.

AVERAGE DOSE—Metric, 15 cc.—Apothecaries, 4 fluidrachms.

OLEUM ROSÆ

Oil of Rose

Ol. Rosa.—Otto of Rose

Oil of Rose is the volatile oil distilled with steam from the fresh flowers of *Rosa gallica* Linné, *Rosa damascena* Miller, *Rosa alba* Linné, and *Rosa centifolia* Linné, and varieties of these species (Fam. *Rosaceæ*).

Description—Oil of Rose is a colorless or yellow liquid, having the characteristic odor and taste of rose. At 25° C. it is a viscous liquid. Upon gradual cooling it changes to a translucent, crystalline mass, which may be easily liquefied by warming.

Solubility—One cc. of Oil of Rose mixes with 1 cc. of chloroform without turbidity. Upon the addition of 20 cc. of 90 per cent alcohol to this solution, the resulting liquid is neutral or faintly acid to moistened litmus paper and deposits a crystalline residue upon standing.

Specific gravity—The specific gravity of Oil of Rose is not less than 0.848 and not more than 0.863 at 30° C. compared with water at 15° C.

Optical rotation—The optical rotation of Oil of Rose is not less than -1° and not more than -4° in a 100-mm. tube, at 25° C., page 601.

Refractive index—The refractive index of Oil of Rose is not less than 1.457 and not more than 1.4630 at 30° C., page 608.

Storage—Preserve Oil of Rose in well-filled, tight containers.

U. S. P. Products of Oil of Rose—Aqua Rosæ, Aqua Rosæ Fortior.

OLEUM ROSMARINI

Oil of Rosemary

Ol. Rosmar.—Rosemary Oil

Oil of Rosemary is the volatile oil distilled with steam from the fresh flowering tops of *Rosmarinus officinalis* Linné (Fam. *Labiataæ*). It yields not less than 1.5 per cent of esters calculated as bornyl acetate ($C_{10}H_{17}-C_2H_3O_2$), and not less than 10 per cent of total borneol ($C_{10}H_{17}OH$), free and as esters.

Description—Oil of Rosemary is a colorless or pale yellow liquid, having the characteristic odor of rosemary, and a warm, camphoraceous taste.

Solubility—Oil of Rosemary is soluble in 10 volumes of 80 per cent alcohol.

Specific gravity—The specific gravity of Oil of Rosemary is not less than 0.894 and not more than 0.912 at 25° C.

Optical rotation—The optical rotation of Oil of Rosemary is not less than -5° and not more than $+10^\circ$ in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Rosemary is not less than 1.4640 and not more than 1.4760 at 20° C., page 608.

Assay for esters—Proceed as directed for the determination of esters under *Oleum Menthae Piperitæ*, page 327, using 10 cc. of Oil of Rosemary. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09814, indicates the number of Gm. of esters, calculated as bornyl acetate, in the Oil taken for the assay.

Assay for total borneol—Proceed as directed for the determination of total menthol under *Oleum Menthae Piperitæ*, page 327, using 10 cc. of Oil of Rosemary. Calculate the per cent of total borneol by the following formula:

Per cent of total borneol in the Oil tested = $\frac{A \times 7.712}{B - (A \times 0.021)} \times [1 - (E \times 0.0021)]$.

A is the result obtained by subtracting the number of cc. of half-normal sulfuric acid required in the titration from the number of cc. of half-normal alcoholic potassium hydroxide originally taken, *B* is the weight of the acetylated oil taken, and *E* is the percentage of esters calculated as bornyl acetate ($C_{10}H_{17} \cdot C_2H_3O_2$).

Storage—Preserve Oil of Rosemary in well-filled, tight containers and avoid exposure to excessive heat.

OLEUM SASSAFRAS

Oil of Sassafras

Ol. Sassaf.—Sassafras Oil

Oil of Sassafras is the volatile oil distilled with steam from the root of *Sassafras albidum* (Nuttall) Nees (Fam. *Lauraceæ*).

Note—If the Oil has solidified in whole or in part, carefully warm it at a low temperature until it is liquefied, then thoroughly mix it before dispensing.

Description—Oil of Sassafras is a yellow or reddish yellow liquid, having the characteristic odor and taste of sassafras.

Solubility—Oil of Sassafras is soluble in 2 volumes of 90 per cent alcohol.

Specific gravity—The specific gravity of Oil of Sassafras is not less than 1.065 and not more than 1.077 at 25° C.

Optical rotation—The optical rotation of Oil of Sassafras is not less than +2° and not more than +4° in a 100-mm. tube at 25° C., page 601.

Refractive index—The refractive index of Oil of Sassafras is not less than 1.5250 and not more than 1.5350 at 20° C., page 608.

Reaction—A solution of recently distilled Oil of Sassafras in 90 per cent alcohol (1 in 2) is neutral to moistened litmus paper.

Heavy metals—Oil of Sassafras meets the requirements of the test for *heavy metals in volatile oils*, page 586.

Storage—Preserve Oil of Sassafras in tight containers.

OLEUM TEREBINTHINÆ

Oil of Turpentine

Ol. Tereb.—Turpentine Oil, "Spirits of Turpentine"

Oil of Turpentine is the volatile oil distilled from the oleoresin obtained from *Pinus palustris* Miller and other species of *Pinus* (Fam. *Pinaceæ*) which yield exclusively terpene oils.

Note—Rectified Oil of Turpentine, page 337, is to be dispensed when Oil of Turpentine is required for internal use.

Description—Oil of Turpentine is a colorless liquid having a characteristic odor and taste, both of which become stronger and less pleasant as the Oil ages or is exposed to air.

Solubility—Oil of Turpentine is soluble in 5 volumes of alcohol.

Specific gravity—The specific gravity of Oil of Turpentine is not less than 0.854 and not more than 0.868 at 25° C.

Optical rotation—Oil of Turpentine is optically active but its rotation is variable, page 601.

Refractive index—The refractive index of Oil of Turpentine is not less than 1.4680 and not more than 1.4780 at 20° C., page 608.

Reaction—An alcoholic solution of recently distilled Oil of Turpentine (1 in 5) is neutral or only slightly acid to moistened litmus paper.

Distillation range—Place 100 cc. of Oil of Turpentine in a standard 100-cc. Engler flask, having the side tube 8 cm. above the top of the bulb, and distil the Oil at the rate of 2 drops per second: 90 per cent of the Oil distills between 154° and 170° C., the temperature being read on a thermometer so placed that its bulb is opposite the side tube of the flask, and the top of its mercury column within the neck of the flask.

Fixed oils—Three drops of Oil of Turpentine placed on white unsized paper and exposed to air, evaporate without leaving a permanent stain.

Mineral oil—Place 20 cc. of fuming sulfuric acid in a graduated, narrow-necked Babcock bottle, stopper, and place in an ice bath to cool, and then add slowly, drop by drop, from a pipette, 5 cc. of the Oil, mixing it with the acid as added by gently shaking or rotating the bottle, and keeping the temperature of the mixture at about 60° to 65° C. by repeated immersion in the ice bath. When agitation no longer causes the mixture to become warm, shake it vigorously for about 30 seconds. Place the bottle on a water-bath, and heat it between 60° and 65° C. for 10 minutes, keeping the contents of the bottle thoroughly mixed by shaking vigorously not less than 6 times during the heating period. (*If the shaking at first is too prolonged and too vigorous, the escaping sulfur dioxide is likely to force some of the mixture out of the neck of the bottle.*) Cool the mixture to room temperature, and add enough sulfuric acid (specific gravity about 1.84) to bring the oily layer into the graduated neck. Centrifuge the bottle and contents for 5 minutes at 1200 revolutions per minute, or for 15 minutes at 900 revolutions per minute, or allow it to stand over night, lightly stoppered. The volume of the reddish or straw-colored viscous layer which separates on top of the dark acid does not exceed 1 per cent of the volume of the Oil taken for the test.

Caution—The addition of Oil of Turpentine to the fuming sulfuric acid must be made only drop by drop, because of the violence of the reaction.

Mineral or rosin oils—Evaporate 5 cc. of Oil of Turpentine in a small tared dish on a water bath: the weight of the residue does not exceed 0.1 Gm.

Other foreign substances—

A: A 5-cc. portion of the Oil, shaken with an equal volume of potassium hydroxide T.S., does not become darker than a light straw yellow after standing for 24 hours.

B: A 5-cc. portion of the Oil, shaken vigorously with an equal volume of hydrochloric acid in a glass-stoppered cylinder and allowed to stand for 5 minutes, does not develop a color darker than a light straw yellow in either the acid or the oily layer.

Storage—Preserve Oil of Turpentine in tight containers.

U. S. P. Product of Oil of Turpentine—Oleum Terebinthinæ Rectificatum.

OLEUM TEREBINTHINÆ RECTIFICATUM

Rectified Oil of Turpentine

Ol. Tereb. Rect.—Rectified Turpentine Oil

Rectified Oil of Turpentine may be prepared as follows:

OIL OF TURPENTINE, a convenient quantity,
SODIUM HYDROXIDE,
DISTILLED WATER, of each, a sufficient quantity.

Prepare a solution of sodium hydroxide, containing 5.3 Gm. of 95 per cent NaOH in each 100 cc., and equal in volume to the Oil to be rectified. Mix this solution and the Oil in a suitable still provided with a well-cooled condenser. Recover about three-fourths of the Oil by distillation, and separate the clear Oil from the water. Dry the Oil by shaking it with anhydrous calcium chloride or with anhydrous sodium sulfate, and filter the product.

Note—Rectified Oil of Turpentine is to be dispensed when Oil of Turpentine is required for internal use. Oil that has become turbid must not be dispensed.

Description—Rectified Oil of Turpentine is a colorless liquid which has the properties of and responds to the tests under *Oleum Terebinthinæ*, page 336, *specific gravity* and *mineral* or *rosin* oils excepted.

Specific gravity—The specific gravity of Rectified Oil of Turpentine is not less than 0.853 and not more than 0.862 at 25° C.

Non-volatile residue—Evaporate 5 cc. of Rectified Oil of Turpentine rapidly in a tared dish on a water bath: the weight of the residue does not exceed 0.015 Gm., page 556.

Storage—Preserve Rectified Oil of Turpentine in well-filled, tight containers and avoid exposure to excessive heat.

U. S. P. Product of Rectified Oil of Turpentine—Emulsum Olei Terebinthinæ.

AVERAGE DOSE—Metric, 0.3 cc.—Apothecaries, 5 minims.

OLEUM THEOBROMATIS

Theobroma Oil

Ol. Theobrom.—Cacao Butter, Cocoa Butter, Oil of Theobroma

Theobroma Oil is the fat obtained from the roasted seed of *Theobroma Cacao* Linné (Fam. *Sterculiaceæ*).

Description—Theobroma Oil is a yellowish white solid, having a faint, agreeable odor, and a bland, chocolate-like taste. Theobroma Oil is usually brittle at temperatures below 25° C.

Solubility—Theobroma Oil is slightly soluble in alcohol, soluble in boiling dehydrated alcohol, and freely soluble in ether and in chloroform.

Melting point—Theobroma Oil melts between 30° and 35° C., page 595.

Specific gravity—The specific gravity of Theobroma Oil is not less than 0.858 and not more than 0.864 at $\frac{100^{\circ} \text{ C.}}{25^{\circ} \text{ C.}}$

Refractive index—The refractive index of Theobroma Oil is not less than 1.4537 and not more than 1.4578 at 40° C., page 608.

Wax, stearin, or tallow—Dissolve 1 Gm. of Theobroma Oil in 3 cc. of ether in a test tube at a temperature of 17° C., and immerse the tube in a mixture of ice and water: the solution does not become turbid or deposit white flakes in less than 3 minutes. After the oil has congealed, raise the temperature to 15° C.: a clear liquid is gradually formed.

Saponification value—The saponification value of Theobroma Oil is not less than 188 and not more than 195, page 579.

Iodine value—The iodine value of Theobroma Oil is not less than 35 and not more than 40, page 579.

Solidification temperature of the fatty acids—The solidifying temperature of the mixed fatty acids of Theobroma Oil is not below 45° and not above 50° C., page 577.

Storage—Preserve Theobroma Oil in well-closed containers.

OPIUM

Opium

Gum Opium

Opium is the air-dried milky exudation obtained by incising the unripe capsules of *Papaver somniferum* Linné or its variety *album* De Candolle (Fam. *Papaveraceæ*).

Opium in its normal air-dried condition yields not less than 9.5 per cent of anhydrous morphine.

Description—In more or less rounded, somewhat flattened masses, usually about 8 to 15 cm. in diameter; externally dark brown, covered with fragments of poppy leaves and at times with fruits of a species of *Rumex* adhering from the packing; more or less plastic when fresh, becoming hard and brittle or tough on keeping; internally, coarsely granular or nearly smooth, dark brown, frequently interspersed with lighter areas, somewhat lustrous; odor characteristic, narcotic; taste very bitter, characteristic.

Assay—Weigh accurately 6 Gm. of Opium, which, if fresh, should be in very small pieces, and, if dry, in a fine powder. Place the Opium in a mortar, and triturate it with about 40 cc. of distilled water for 15 minutes. Transfer the mixture completely to a flask with the aid of 30 cc. of warm distilled water. Stopper the flask, and shake it every 10 minutes, or continuously in a mechanical shaker during 1 hour. Pour the contents as evenly as possible upon a wetted filter of from 10 to 11 cm. in diameter or, preferably, upon a sintered glass funnel attached to a suction flask. When the liquid has drained off, wash the residue with about 20 cc. of distilled water, carefully dropped upon the edges of the filter and its contents. Transfer the moist residue to a mortar, rub it to a smooth paste, then rinse it into the original flask with 40 cc. of distilled water. Shake it thoroughly during 10 minutes, and return the entire mixture to the filter. When the liquid has drained off, wash the residue with small portions of distilled water until the washings are nearly colorless. Evaporate the filtrates and washings, in a tared dish, to about 30 Gm., and allow to cool. Now add 3 Gm. of freshly slaked lime, triturate the mixture for 15 minutes, and transfer it completely to a tared flask with the aid of small portions of distilled water. Then add sufficient distilled water to make the mixture weigh 54 Gm., and mix well. Filter the mixture, using a dry filter of 10 to 11 cm. in diameter, collecting the filtrate in a dry cylinder or small flask. During the filtration keep the funnel covered with a glass plate and its stem well within the neck of the receiving vessel.

Place 34 Gm. of the filtrate, corresponding to 4 Gm. of Opium, in an Erlenmeyer flask of suitable capacity, add 2 cc. of alcohol and 15 cc. of ether, and, after shaking the mixture, add 1 Gm. of ammonium chloride. Stopper the flask, shake it frequently during 10 minutes, and set it aside over night at a temperature of 5° to 10° C. Remove the stopper, and brush any adhering crystals back into the flask. Decant the ether layer through a small filter paper, rinse the flask and contents with 15 cc. of ether, and pass these washings through the filter. Again wash the filter with an additional small quantity of ether. When all of the ether has passed through the filter, pour the aqueous layer upon the filter without trying to remove

the crystals from the flask. Wash the crystals in the flask and the contents of the filter with distilled water, previously saturated with morphine, until the washings are colorless. Then add, dropwise, 1 cc. of cold, distilled water to displace the morphinated water.

Add to the flask containing the crystals about 15 cc. of boiling neutral methanol, agitate to dissolve as much of the morphine as possible, and pour the boiling solution over the morphine on the filter, receiving the filtrate in a suitable dry flask. Repeat this treatment with boiling, neutral methanol eight to ten times, using 5 to 7 cc. each time, until all of the morphine has been dissolved. Cool the methanol solution, and add to it exactly 25 cc. of tenth-normal sulfuric acid. Dilute the solution with 75 cc. of distilled water, and boil it carefully, or evaporate it on a steam bath, to a volume of about 50 cc. Cool, and titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.02853 Gm. of anhydrous morphine.

U. S. P. Products of Opium—Æthylmorphinæ Hydrochloridum, Apomorphinæ Hydrochloridum, Codeinæ Phosphas, Codeinæ Sulfas, Dihydromorphinonæ Hydrochloridum, Morphinæ Sulfas, Opium Granulatum, Opium Pulveratum, Tinctura Opii, Tinctura Opii Camphorata, Tabellæ Codeinæ Phosphatis, Tabellæ Codeinæ Sulfatis, Tabellæ Dihydromorphinonæ Hydrochloridi, Tabellæ Morphinæ Sulfatis.

OPIMUM GRANULATUM

Granulated Opium

Opium Gran.

Opium dried at a temperature not exceeding 70° C. and reduced to a powder, all of which will pass through a number 16 standard mesh sieve and not more than 10 per cent through a number 60 standard mesh sieve.

Granulated Opium yields not less than 10 per cent and not more than 10.5 per cent of anhydrous morphine. Granulated Opium of a higher morphine percentage may be reduced to the official standard by admixture with granulated opium of a lower percentage, or with any of the diluents permitted for powdered extracts under *Extracta*, page 174.

Description—When powdered, Granulated Opium corresponds to the description under *Opium Pulveratum*, page 340.

Assay—Proceed as directed under *Opium*, page 339.

Storage—Preserve Granulated Opium in well-closed containers.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

OPIMUM PULVERATUM

Powdered Opium

Opium Pulv.—Opii pulvis P.I.

Opium dried at a temperature not exceeding 70° C. and reduced to a very fine powder.

Powdered Opium yields not less than 10 per cent and not more than 10.5 per cent of anhydrous morphine. Powdered Opium of a higher morphine percentage may be reduced to the official standard by admixture with powdered opium of a lower percentage, or with any of the diluents permitted for powdered extracts under *Extracta*, page 174.

Description—Light brown to moderate yellowish brown, consisting chiefly of yellowish brown to yellow, more or less irregular and granular fragments, varying from 15 to 150 microns in diameter; a few fragments of strongly lignified, thick-walled, 4- to 5-sided or narrowly elongated, epidermal cells of the poppy capsule; very few fragments of tissues of poppy leaves, poppy capsules, and occasionally *Rumex* fruits. In addition, there will be the microscopic characteristics of the diluent if any has been used in the preparation of the powder.

Assay—Proceed as directed under *Opium*, page 339.

Storage—Preserve Powdered Opium in well-closed containers.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

OUABAINUM

Ouabain

Ouabain.—G-Strophanthin

$C_{29}H_{44}O_{12} \cdot 8H_2O$

Mol. wt. 728.77

Ouabain is a glycoside occurring in *Acokanthera Ouabaio* Arnaud and obtained from the seeds of *Strophanthus gratus* (Wall. et Hook.) Baillon (Fam. *Apocynaceæ*).

Description—Ouabain occurs as white, odorless crystals, or as a crystalline powder. It is stable in air, but is affected by light.

Caution—Ouabain is extremely poisonous.

Solubility—One Gm. of Ouabain dissolves slowly in about 75 cc. of water, and in about 100 cc. of alcohol at 25° C. It is more soluble in hot water and in hot alcohol.

Melting point—Ouabain, previously dried at 130° C., melts between 186° and 189° C., the bath being preheated to 170° C., page 595.

Optical rotation—The specific rotation, $[\alpha]_D^{25}$, of Ouabain, determined in an aqueous solution containing the equivalent of 1 Gm. of anhydrous Ouabain in 100 cc. of solution, is not less than -31° and not more than -32.5° , using a 100-mm. tube, page 601.

Identification—

A: Dissolve about 2 mg. of Ouabain in 2 cc. of sulfuric acid: a color develops which is dark red by transmitted light and shows a greenish fluorescence in reflected light.

B: Heat about 0.1 Gm. of Ouabain with 5 cc. of diluted sulfuric acid until solution is complete, and then boil for 1 or 2 minutes: the solution becomes brownish and a turbidity develops. Cool, filter, add to the filtrate 5 cc. of an aqueous solution of sodium hydroxide (1 in 10) and 3 cc. of alkaline cupric tartrate T.S., and boil: a red precipitate of cuprous oxide forms.

Loss on drying—Dry about 0.2 Gm. of Ouabain to constant weight at 130° C.: the loss in weight corresponds to not less than 18 per cent and not more than 22 per cent.

Ash—The ash from 0.1 Gm. of Ouabain is negligible, page 556.

Reaction—An aqueous solution of Ouabain in warm distilled water (1 in 50) is neutral to litmus paper.

Alkaloids—An aqueous solution of Ouabain (1 in 100) yields no precipitate with tannic acid T.S. or with iodine T.S.

Storage—Preserve Ouabain in tight, light-resistant containers.

U. S. P. Product of Ouabain—Injectio Ouabaini.

AVERAGE DOSE—Intravenous—Metric, 0.25 mg.—Apothecaries, $\frac{1}{250}$ grain.

OXIDUM NITROSUM

Nitrous Oxide

Oxid. Nitros.—Nitrogenii Monoxidum U. S. P. XI, Nitrogen Monoxide U. S. P. XI

N_2O

Mol. wt. 44.02

Nitrous Oxide contains not less than 95 per cent by volume of N_2O .

Description—Nitrous Oxide is a colorless gas, without appreciable odor or taste.

A liter of Nitrous Oxide at a pressure of 760 mm. and at 0° C. weighs 1.977 Gm.

Solubility—One volume of Nitrous Oxide dissolves in about 1.5 volumes of water under normal pressure and at 20° C. It is more freely soluble in alcohol than in water. It is readily soluble in ether and in oils.

Note—Cylinders containing Nitrous Oxide must be kept at a temperature between 20° and 30° C. for at least 6 hours before withdrawing the Nitrous Oxide for the following determinations. Gas volumes for the following tests and assays are to be measured at room temperature and corrected to a pressure of 760 mm. and a temperature of 25° C.

Acids or alkalis—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling distilled water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of 3 color-comparator tubes of clear glass, of approximately the same size and marked "A," "B," and "C," respectively. Add 0.2 cc. of hundredth-normal hydrochloric acid to tube "B," and 0.4 cc. of hundredth-normal hydrochloric acid to tube "C." Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Nitrous Oxide through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Nitrous Oxide through 50 cc. of barium hydroxide T.S. The test solution must be devoid of turbidity prior to the test. Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of gas. The delivery tube must have an orifice approximately 1 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the barium hydroxide solution. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with the 50 cc. of the solution. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution, prepared by dissolving 0.1 Gm. of sodium bicarbonate in 100 cc. of freshly boiled and cooled distilled water, is added to another 50-cc. portion of barium hydroxide T.S. under the prescribed conditions.

Oxidizing substances—Pass 2000 cc. of Nitrous Oxide, under conditions comparable to those in the test for carbon dioxide, through 15 cc. of freshly prepared starch-potassium iodide T.S. to which has been added 1 drop of glacial acetic acid. The color of the test solution is not altered by the passage of the Nitrous Oxide, as shown by comparing it with another portion of the acidified starch-potassium iodide T.S. through which the gas has not been passed.

Reducing substances—Pass 2000 cc. of Nitrous Oxide, under conditions comparable to those in the test for carbon dioxide, through a solution of 0.2 cc. of tenth-normal potassium permanganate in 100 cc. of distilled water. Neither the color

nor the intensity of the color of the liquid is changed, when compared with the untreated solution.

Halogens—Pass 2000 cc. of Nitrous Oxide, under conditions comparable to those in the test for *carbon dioxide*, through a mixture of 100 cc. of distilled water and 1 cc. of silver nitrate T.S. The liquid shows no greater degree of opalescence than does a mixture of 100 cc. of distilled water and 1 cc. of silver nitrate T.S., prepared at the same time as that through which the gas passes, the observation being made in 100-cc., low-form Nessler tubes which are closely similar in all respects.

Assay—Close both stopcocks, immerse the condensation bulb of the assay apparatus, as described on page 600, in liquid nitrogen to the level where the stem joins the bulb, maintaining the liquid nitrogen to within a few mm. of this height. The manometer should almost immediately show a constant reading, indicating the establishment of equilibrium. Select an arbitrary pressure as a standard (50 mm. is satisfactory) and adjust the system to within ± 0.5 mm. of the selected pressure by the addition or removal of air through the burette by means of the leveling bulb, using a hand lens in reading the mercury levels. The pressure reading should remain constant for several minutes to insure a gas-tight system.

Open the burette stopcock so as to communicate with the atmosphere at "A," adjust the leveling bulb so that the burette and the capillary outlet "A" are completely filled with mercury, close the stopcock, and raise the leveling bulb slightly above the outlet tube. With the cylinder in an upright position attach rubber tubing to the valve of the cylinder of Nitrous Oxide to be tested. Flush gas through the tubing and with the gas flowing, attach the tubing to the gas burette at "A," and immediately open the stopcock. Collect slightly more than 100 cc. of the gas in the burette, against the pressure of the mercury, close the stopcock, disconnect the cylinder of gas, and by means of the leveling bulb adjust the volume of gas in the burette to 100 cc. (± 0.1 cc.).

Cautiously open the burette stopcock so as to connect it with the condensation bulb "C," and allow the mercury to rise in the burette until it reaches the plug of the stopcock. Read the manometer pressure after allowing 15 or 20 seconds for the complete condensation of the gas in bulb "C." Determine the difference in mm. of mercury between the present pressure and the selected standard pressure, also record the barometric pressure and the room temperature, and determine the per cent of uncondensable gas by the following formula:

$$\text{Per cent of uncondensable gas in the Nitrous Oxide tested} = \frac{100 \text{ PVT}_1}{P_1 V_1 T}$$

P = increase in pressure in mm. of mercury as determined from the manometer readings.

V = volume in cc. of the condensation bulb.

T₁ = room temperature (absolute).

P₁ = barometric pressure in mm. of mercury.

V₁ = volume in cc. of the Nitrous Oxide tested.

T = temperature (absolute) of the liquid nitrogen bath.

The volume of uncondensable gas does not exceed 5 cc.

The foregoing determination may be checked by measuring the increase in volume in the system due to the uncondensable portion of the gas taken for the assay, proceeding as follows: When the final pressure on the manometer has been recorded, open the burette stopcock so as to communicate with the condensation bulb, after the leveling bulb has been placed in a considerably lowered position so as to avoid the drawing of mercury into the bulb. Adjust the leveling bulb so that the manometer reading corresponds to that of the selected standard pressure, close the burette stopcock, and, by means of the leveling bulb, adjust the pressure on the gas in the burette to equal the atmospheric pressure. The number of cc. of gas represents the percentage of uncondensable gas in the Nitrous Oxide being tested.

After each series of 10 determinations, open the stopcock "D" to the atmosphere, remove the liquid nitrogen bath from the condensation bulb, and maintain this condition until the temperature of the bulb returns to normal or until no liquid Nitrous Oxide can be seen in the bulb.

Storage—Preserve Nitrous Oxide in tight containers.

OXYGENIUM

Oxygen

Oxygen.

 O_2

Mol. wt. 32.00

Oxygen contains not less than 99 per cent by volume of O_2 .

Description—Oxygen is a colorless, odorless, tasteless gas, which supports combustion more energetically than air. A liter of Oxygen at a pressure of 760 mm. and at $0^\circ C.$ weighs 1.429 Gm.

Solubility—One volume of Oxygen dissolves in about 32 volumes of water and in about 7 volumes of alcohol at $20^\circ C.$, and at 760 mm. pressure.

Identification—A glowing splinter of wood held in Oxygen bursts into flame.

Note—Cylinders containing Oxygen must be kept at a temperature between 20° and $30^\circ C.$ for at least 6 hours before withdrawing the Oxygen for the following determinations. Gas volumes for the following tests and assays are to be measured at room temperature and corrected to a pressure of 760 mm. and a temperature of $25^\circ C.$

Acids or alkalies—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling distilled water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of 3 color-comparator tubes of clear glass, of approximately the same size, and marked "A," "B," and "C," respectively. Add 0.2 cc. of hundredth-normal hydrochloric acid to tube "B," and 0.4 cc. of hundredth-normal hydrochloric acid to tube "C." Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Oxygen through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Oxygen through 50 cc. of barium hydroxide T.S. The test solution must be devoid of turbidity prior to the test. Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of gas. The delivery tube must have an orifice of approximately 1 mm. in diameter, and must extend to within 2 mm. of the bottom of the vessel containing the barium hydroxide solution. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with the 50 cc. of the solution. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution, prepared by dissolving 0.1 Gm. of sodium bicarbonate in 100 cc. of freshly boiled and cooled distilled water, is added to another 50-cc. portion of barium hydroxide T.S. under the prescribed conditions.

Oxidizing substances—Pass 2000 cc. of Oxygen, under conditions comparable to those in the test for *carbon dioxide*, through 15 cc. of freshly prepared starch-potassium iodide T.S. to which has been added 1 drop of glacial acetic acid. The color of the test solution is not altered by the passage of the Oxygen, as shown by comparing it with another portion of the acidified starch-potassium iodide T.S. through which the gas has not been passed.

Halogens—Pass 2000 cc. of Oxygen, under conditions comparable to those in the test for *carbon dioxide*, through a mixture of 100 cc. of distilled water and 1 cc. of silver nitrate T.S. The liquid shows no greater degree of opalescence than does a mixture of 100 cc. of distilled water and 1 cc. of silver nitrate T.S., prepared at the same time as that through which the gas passes, the observation being made in 100-cc., low-form Nessler tubes which are closely similar in all respects.

Carbon monoxide—Oxygen meets the requirements of the test for *Carbon Monoxide in Oxygen*, page 562.

Assay—Place a sufficient quantity of mercury in a 100-cc. calibrated nitrometer, provided with a two-way stopcock and a two-way outlet, and properly connected with a balancing tube. Connect one of the outlet tubes of the nitrometer with a gas pipette of suitable capacity. Place in the pipette a coil of copper wire which extends to the uppermost portion of the bulb, and add about 125 cc. of ammonium chloride-ammonium hydroxide T.S. Draw the liquid (free from air bubbles)

through the capillary opening connection and stopcock opening in the nitrometer by reducing the pressure in the nitrometer tube and opening the stopcock controlling the connection with the gas pipette. Then close the stopcock. Having completely filled the nitrometer, the other stopcock opening, and the other intake tube with mercury, draw into the nitrometer exactly 100 cc. of Oxygen by reducing the pressure in the tube. Close this stopcock. Increase the pressure on the Oxygen in the nitrometer tube, and open the stopcock controlling the connection with the gas pipette. Force the entire volume of gas into the pipette. Close the stopcock, and rock the pipette gently, providing frequent contact of the liquid, gas, and copper spiral. At the end of 15 minutes most of the gas will have been absorbed by the liquid. At this time, to facilitate the absorption of the last portion of the Oxygen, draw some of the liquid into the nitrometer tube, and force the residual gas back upon the surface of the liquid in the gas pipette. Again rock the pipette until no further diminution in the volume of the gas occurs. Draw the residual gas, if any, into the nitrometer tube, and measure its volume.

The volume of gas remaining undissolved does not exceed 1 cc.

Storage—Preserve Oxygen in tight containers.

PAMAQUINÆ NAPHTHOAS

Pamaquine Naphthoate

Pamaquin. Naphth.—Aminoquin Naphthoate

$C_{42}H_{45}N_3O_7$

Mol. wt. 703.8

Pamaquine naphthoate is the methylene-bis- β -hydroxynaphthoate of 6-methoxy-8-(1-methyl-4-diethylamino)butylaminoquinoline. It contains, when dried at 100° C. for 6 hours, not less than 43 per cent and not more than 45 per cent of 6-methoxy-8-(1-methyl-4-diethylamino)butylaminoquinoline(pamaquine base) and not less than 53 per cent and not more than 57 per cent of methylene-bis- β -hydroxynaphthoic acid.

Description—Pamaquine Naphthoate occurs as a yellow to orange yellow, odorless powder, tasteless, or nearly so, and having a local anesthetic effect when placed on the tongue.

Solubility—Pamaquine Naphthoate is insoluble in water, but soluble in alcohol and in acetone.

Identification—

- A: Dissolve 0.2 Gm. of Pamaquine Naphthoate in 5 cc. of acetone, and add 1 cc. of hydrochloric acid: a pale yellow precipitate is formed. Add 5 cc. of distilled water, filter, and to 1 cc. of the filtrate add a solution of 40 mg. of potassium iodate in 1 cc. of distilled water: an intense violet color suddenly develops after an interval of about 2 minutes.
- B: To 20 mg. of finely powdered Pamaquine Naphthoate add 2 cc. of sulfuric acid, stir well, and add 3 drops of solution of formaldehyde: a green color gradually develops.
- C: Suspend 0.2 Gm. of Pamaquine Naphthoate in 5 cc. of sodium hydroxide T.S. in a separator, and extract with 20 cc. of ether. Evaporate the ether to dryness, and take up the residue in 6 cc. of dilute acetic acid (1 in 10), add a hot solution of 50 mg. of chloranil in 3 cc. of glacial acetic acid, and heat: an intense blue color develops.

Loss on drying—When dried at 100° C. for 6 hours, Pamaquine Naphthoate loses not more than 4 per cent of its weight.

Ash—Pamaquine Naphthoate yields not more than 1.0 per cent of ash, page 556.

Assay for methylene-bis- β -hydroxynaphthoic acid—Transfer about 1 Gm. of Pamaquine Naphthoate, previously dried at 100° C. for 6 hours and accurately weighed, to a 250-cc. beaker, and add 15 cc. of diluted hydrochloric acid. Stir well with a glass rod at 10-minute intervals for 1 hour, cover with a watch glass and let stand over night. Dilute with 100 cc. of distilled water, and filter through a tared filtering crucible. Wash the beaker and the crystals with distilled water until a 0.5-cc. portion of the last washings, when acidified with diluted nitric acid, does not become turbid upon the addition of silver nitrate T.S. Preserve the combined filtrate and washings. Dry the crystals to constant weight at 100° C.

Assay for pamaquine base—Transfer the combined filtrate and washings from the assay for methylene-bis- β -hydroxynaphthoic acid to a casserole, cool to 15° C., add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 0.03154 Gm. of pamaquine base ($C_{19}H_{29}N_3O$).

Storage—Preserve Pamaquine Naphthoate in tight, light-resistant containers.

AVERAGE DOSE—Metric, 20 mg.—Apothecaries, $\frac{1}{3}$ grain.

PANCREATINUM

Pancreatin

Pancreat.

Pancreatin is a substance containing enzymes, principally pancreatic amylase, trypsin, and pancreatic lipase, obtained from the fresh pancreas of the hog, *Sus scrofa* Linné var. *domesticus* Gray (Fam. *Suidæ*) or of the ox, *Bos taurus* Linné (Fam. *Bovidæ*). Pancreatin converts not less than 25 times its weight of starch into soluble carbohydrates, and not less than 25 times its weight of casein into proteoses. Pancreatin of a higher digestive power may be brought to this standard by admixture with lactose or with pancreatin of lower digestive power.

Description—Pancreatin is a cream-colored, amorphous powder, having a faint, characteristic, but not offensive odor.

Solubility—Pancreatin is slowly and incompletely soluble in water; it is insoluble in alcohol.

Identification—Pancreatin changes protein into proteoses and derived substances, and converts starch into dextrins and sugars. Its greatest activities are in neutral or faintly alkaline media; more than traces of mineral acids or large amounts of alkali hydroxides render it inert. An excess of alkali carbonate also inhibits its action.

Fat—Introduce 2 Gm. of Pancreatin into a flask of about 50-cc. capacity, add 20 cc. of ether, stopper, and set it aside for several hours, mixing by rotating at frequent intervals. Decant the supernatant ether by means of a guiding rod into a plain filter of about 7-cm. diameter, previously moistened with ether, and collect the filtrate in a tared beaker. To the residue remaining in the flask add a further portion of 10 cc. of ether, proceeding as directed before, then a third portion of 10 cc. of ether, and transfer the ether and the remainder of the Pancreatin to the filter. Allow to drain, evaporate the ether spontaneously, and dry the beaker and

residue to constant weight at 100° C.: the residue of fat weighs not more than 60 mg.

Assay for starch digestive power—Determine the percentage of moisture in potato starch by drying about 0.5 Gm., accurately weighed, at 120° C., for 4 hours. Thoroughly mix a quantity of the starch, equivalent to 3.75 Gm. of dry starch, with 10 cc. of cold distilled water. Add the mixture with constant stirring to 75 cc. of distilled water, previously heated to about 55° C., contained in a tared, 250-cc. beaker. Rinse the remaining starch into the beaker with 10 cc. of distilled water. Heat the mixture to boiling, and boil it gently, with constant stirring, for 5 minutes, or until a translucent, uniform paste is obtained. Add enough distilled water to make the mixture weigh 100 Gm., cool the paste to 40° C., and place the beaker in a water bath maintained at 40° C. Suspend 0.15 Gm. of Pancreatin in 5 cc. of distilled water, and add the suspension to the starch paste, mixing it well by pouring the mixture from beaker to beaker for 30 seconds, noting the time when the Pancreatin suspension was added to the starch. Maintain the mixture at a temperature of 40° C. for exactly 5 minutes. Stir, and at once add 0.1 cc. of this mixture to a previously made mixture of 0.2 cc. of tenth-normal iodine and 60 cc. of distilled water at a temperature of from 23° to 25° C.: no blue or violet color is produced.

Assay for casein digestive power—Place 0.1 Gm. of finely powdered casein in a 50-cc. volumetric flask, add 30 cc. of distilled water, and shake well to bring the casein into suspension. Add exactly 1 cc. of tenth-normal sodium hydroxide, and heat the mixture at 40° C. until the casein is completely dissolved, which should not require more than 30 minutes. Cool, add sufficient distilled water to make 50 cc., and mix well. Dissolve 0.1 Gm. of Pancreatin in 500 cc. of distilled water. Mix 1 cc. of glacial acetic acid with 9 cc. of distilled water and 10 cc. of alcohol. Place 5 cc. of the casein solution in a test tube, add to it 2 cc. of the well-shaken Pancreatin solution and 3 cc. of distilled water, and mix by gentle agitation. Immediately immerse the test tube in a water bath at 40° C., and keep it at this temperature for 1 hour. Then remove it from the bath, and add 3 drops of the acetic acid mixture. No precipitate is produced.

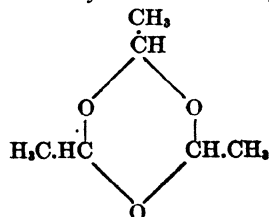
Storage—Preserve Pancreatin in tight containers, preferably at a temperature not above 30° C.

AVERAGE DOSE—Metric, 0.5 Gm.—Apothecaries, 7½ grains.

PARALDEHYDUM

Paraldehyde

Paraldehyd.—Paracetaldehyde



$\text{C}_6\text{H}_{12}\text{O}_3$

Mol. wt. 132.16

Description—Paraldehyde is a colorless, transparent liquid. It has a strong, characteristic, but not unpleasant or pungent odor, and a disagreeable taste.

Solubility—One cc. of Paraldehyde dissolves in about 8 cc. of water at 25° C., and in about 17 cc. of boiling water. It is miscible with alcohol, chloroform, ether, and with volatile oils.

Specific gravity—The specific gravity of Paraldehyde is about 0.990 at 25° C.

Distillation range—Paraldehyde distils between 120° and 126° C., page 559.

Congeaing temperature—The congealing point of Paraldehyde is not below 11° C., page 566.

Identification—When heated with a small quantity of diluted sulfuric acid, Paraldehyde is converted into acetaldehyde, recognizable by its odor.

Free acid—A mixture of 6 cc. of Paraldehyde with 100 cc. of distilled water and 5 drops of phenolphthalein T.S. acquires a pink color on the addition of not more than 0.5 cc. of normal sodium hydroxide.

Chloride—To 5 cc. of an aqueous solution of Paraldehyde (1 in 10), add 1 drop of nitric acid and 3 drops of silver nitrate T.S.: no opalescence is produced at once.

Sulfate—To 5 cc. of an aqueous solution of Paraldehyde (1 in 10) add 1 drop of hydrochloric acid and 3 drops of barium chloride T.S.: no turbidity is produced.

Amyl alcohol—One cc. of Paraldehyde gives with 10 cc. of distilled water, at 25° C., a clear solution, free from oily drops.

Residue on evaporation—Heat 5 cc. of Paraldehyde in a small evaporating dish on a water bath: no disagreeable odor is noticeable as the last portions evaporate and not more than 3 mg. of residue remains.

Acetaldehyde—Place 100 cc. of distilled water in a 300-cc. Erlenmeyer flask, add 5 cc. of Paraldehyde, and shake the mixture gently until solution is complete. Add 5 cc. of a solution of hydroxylamine hydrochloride (made by dissolving exactly 3.5 Gm. of hydroxylamine hydrochloride in sufficient distilled water to make 100 cc.). Shake the mixture gently for 30 seconds, add 2 drops of methyl orange T.S., and titrate immediately with half-normal sodium hydroxide. Perform a blank determination with the same quantities of reagents, and in the same manner: the difference between the determinations does not exceed 1 cc. of half-normal sodium hydroxide.

Storage—Preserve Paraldehyde in well-filled, tight, light-resistant containers which hold not more than 120 Gm., preferably at a temperature not above 30° C.

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

PELLETIERINÆ TANNAS

Pelletierine Tannate

Pellet. Tann.

Pelletierine Tannate is a mixture in varying proportions of the tannates of the several alkaloids obtained from pomegranate, *Punica Granatum* Linné (Fam. *Punicaceæ*). It contains an amount of the alkaloids equivalent to not less than 20 per cent as the hydrochloride.

Description—Pelletierine Tannate occurs as a light yellow, odorless, amorphous powder, having an astringent taste. It is affected by light.

Solubility—One Gm. of Pelletierine Tannate dissolves in about 250 cc. of water at 25° C. It is soluble in alcohol, slightly soluble in ether, and insoluble in chloroform. It is dissolved by warm dilute acids.

Identification—A saturated, aqueous solution of Pelletierine Tannate is colored blue black by ferric chloride T.S.

Ash—The ash from 0.2 Gm. of Pelletierine Tannate is negligible, page 556.

Carbonizable substances—Stir about 1 mg. of the residue obtained in the test for total alkaloids, on a white, porcelain surface with 2 drops of sulfuric acid: the mixture develops no color other than a light yellow or a light brown.

Reaction—A saturated, aqueous solution of Pelletierine Tannate is acid to litmus paper.

Foreign alkaloids—Platinic chloride T.S. produces no precipitate in a cold solution of about 0.1 Gm. of Pelletierine Tannate in a mixture of 4 cc. of distilled water and 1 cc. of diluted hydrochloric acid.

Assay—To about 0.5 Gm. of Pelletierine Tannate, accurately weighed, add 10 cc. of sodium hydroxide T.S., and shake the mixture with four successive portions of 15, 10, 10, and 10 cc. of chloroform. Acidify the combined chloroform solutions with 0.1 cc. of hydrochloric acid, and evaporate to apparent dryness on a water bath. Dissolve the residue in 5 cc. of alcohol, again evaporate, and dry for 1 hour at 60° C.: the weight of the residue is not less than 20 per cent of the weight of Pelletierine Tannate taken for the test.

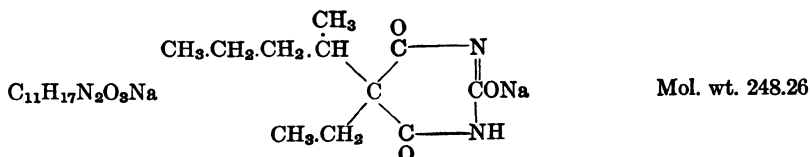
Storage—Preserve Pelletierine Tannate in tight, light-resistant containers.

AVERAGE DOSE—Metric, 0.25 Gm.—Apothecaries, 4 grains.

PENTOBARBITALUM SODICUM

Pentobarbital Sodium

Pentobarb. Sod.—Pentobarbitalum Solubile U. S. P. XI,
Soluble Pentobarbital U. S. P. XI



Pentobarbital Sodium contains not less than 90 per cent and not more than 92 per cent of pentobarbital ($\text{C}_{11}\text{H}_{15}\text{N}_2\text{O}_3$), calculated on a moisture-free basis, the moisture being determined on a separate portion by drying at 90° C. for 6 hours.

Description—Pentobarbital Sodium occurs as white, crystalline granules, or as a white powder. It is odorless, and has a slightly bitter taste.

Solubility—Pentobarbital Sodium is very soluble in water, and is freely soluble in alcohol, but practically insoluble in ether.

Identification—

- A: Add a slight excess of diluted hydrochloric acid to 5 cc. of an aqueous solution of Pentobarbital Sodium (1 in 10): a white precipitate of pentobarbital is produced.
- B: Boil about 0.2 Gm. of Pentobarbital Sodium with 5 cc. of an aqueous solution of sodium hydroxide (1 in 4): ammonia is evolved.
- C: Dissolve about 0.3 Gm. of Pentobarbital Sodium in 10 cc. of distilled water, and divide into two portions. To one portion add 1 cc. of mercury bichloride T.S.: a white precipitate results, soluble in an excess of ammonia T.S. To the other portion add 5 cc. of silver nitrate T.S.: a white precipitate results, soluble in an excess of ammonia T.S.
- D: Ignite about 0.5 Gm. of Pentobarbital Sodium: the residue, when moistened with distilled water, effervesces upon the addition of diluted hydrochloric acid, and responds to the tests for sodium, page 592.
- E: The residue of pentobarbital obtained in the assay melts between 127° and 130° C., page 595.

Loss on drying—When dried at 90° C. for 6 hours, Pentobarbital Sodium loses not more than 5 per cent of its weight.

Carbonizable substances—Dissolve 0.5 Gm. of Pentobarbital Sodium in 5 cc. of sulfuric acid: at the end of 5 minutes, the solution has no more color than matching fluid B, page 563.

Reaction—An aqueous solution of Pentobarbital Sodium is alkaline to litmus paper and to phenolphthalein T.S.

Chloride—Dissolve about 0.5 Gm. of Pentobarbital Sodium in 50 cc. of distilled water, add 5 cc. of diluted nitric acid, and filter: 10 cc. of the filtrate shows no opalescence at once upon the addition of a few drops of silver nitrate T.S.

Sulfate—A separate 10-cc. portion of the filtrate obtained in the test for *chloride* shows no turbidity upon the addition of a few drops of barium chloride T.S.

Heavy metals—Dissolve 1 Gm. of Pentobarbital Sodium in 45.5 cc. of distilled water. Add slowly, with stirring, 4.5 cc. of normal hydrochloric acid, allow to stand for several minutes and filter. The heavy metals limit, page 586, for Pentobarbital Sodium, determined in 25 cc. of the filtrate, is 30 parts per million.

Free pentobarbital—Place about 1 Gm. of Pentobarbital Sodium, accurately weighed, in a glass-stoppered cylinder, add 50 cc. of absolute ether, stopper, and shake the mixture for 10 minutes. Decant the supernatant liquid through filter paper into a tared beaker, and repeat the operation twice, using 25 cc. and 15 cc. of ether, respectively, and the same filter. Carefully evaporate the combined filtrates to dryness, and dry the residue to constant weight at 90° C.: the weight of the residue does not exceed 0.5 per cent of the weight of the Pentobarbital Sodium taken.

Assay—Dissolve about 0.5 Gm. of Pentobarbital Sodium, accurately weighed, in 50 cc. of distilled water in a separator. Add 10 cc. of diluted hydrochloric acid, and completely extract the liberated pentobarbital with successive portions of 25 cc. each of ether. Wash the combined ether extracts with two 5-cc. portions of distilled water, evaporate the ether in a tared dish, and dry the residue to constant weight at 90° C. The weight of the pentobarbital ($C_{11}H_{12}N_2O_3$) so obtained corresponds to not less than 90 per cent and not more than 92 per cent of the Pentobarbital Sodium taken, calculated on a moisture-free basis.

Storage—Preserve Pentobarbital Sodium in tight containers.

U. S. P. Products of Pentobarbital Sodium—Capsulæ Pentobarbitali Sodici, Tabellæ Pentobarbitali Sodici.

AVERAGE DOSE—Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

PERPOLITIONES ORYZÆ

Rice Polishings

Perpol. Oryz.—Rice Bran, Tikitiki

Rice Polishings consist of the fine, flaky pericarp and spermoderm fragments, the embryo, aleurone layer, and outer adhering cells of the starchy endosperm of the grain of *Oryza sativa* Linné (Fam. *Gramineæ*).

Rice Polishings contain not more than 40 per cent of starch and not more than 10 per cent of rice hull or other foreign matter.

Description—Rice Polishings occur as a fine, flaky, yellowish white to pale orange powder with a non-rancid odor and sweetish taste.

Histology—Numerous scale-like fragments of the pericarp consisting of the epicarp with transversely elongated cells having deeply sinuous end walls, the mesocarp

of transversely elongated cells, the cross cell layer of vermiform cells, all pressed together and traversed by elongated tube cells; fragments of the spermoderm and perisperm of delicate transversely elongated cells arranged in parallel rows, the former staining yellow, the latter blue with chlor-zinc iodine T.S.; fragments of the aleurone layer of rectangular to polygonal shaped cells containing protein granules and oil globules; fragments of the embryo with small, thin-walled, rectangular and polygonal cells containing protein granules and oil globules; fragments of starchy endosperm of polygonal to radially elongated parenchyma cells containing starch grains; numerous starch grains, simple and in oval or spheroidal aggregates, the individual grains up to 10 microns in diameter; occasional irregular fragments of the hull of pale orange color which, when heated in a 1 per cent solution of sodium hydroxide and mounted, exhibit rows of large, sinuous, thick-walled, siliceous outer epidermal cells of the paleet with or without tooth-like projections, sometimes interspersed with short unicellular hairs on their bases.

Rice hull or other foreign matter—Pass Rice Polishings through a standard, No. 30 mesh sieve: not more than 10 per cent remains on the sieve.

Identification—Macerate 5 Gm. of Rice Polishings with 10 cc. of distilled water for 15 minutes with frequent stirring. Filter the suspension through gauze, expressing the liquid from the marc, and refilter the liquid through filter paper. To 1 cc. of the filtrate add 2 cc. of diazotized *p*-amino acetophenone T.S. and allow it to stand 1 hour, then add 5 cc. of isobutyl alcohol, shake well, and permit the isobutyl alcohol to separate from the aqueous layer: the isobutyl alcohol layer is colored pink to purple.

Starch—Add about 3 Gm. of Rice Polishings, accurately weighed, to 50 cc. of cold distilled water and stir frequently for 1 hour. Filter through a smooth filter paper and wash the residue with 250 cc. of cold distilled water. Transfer the residue to a 500-cc. flask, add 200 cc. of distilled water and 20 cc. of dilute hydrochloric acid (specific gravity 1.125) and heat on a water bath under a reflux condenser for 2½ hours. Cool the mixture, nearly neutralize with sodium hydroxide T.S., add distilled water to make exactly 250 cc., and filter. Place 50 cc. of alkaline cupric tartrate T.S., in a 400-cc. beaker and heat to boiling. Add exactly 25 cc. of the above filtrate, and boil for exactly 2 minutes, keeping the beaker covered. At once collect the cuprous oxide thus formed on a mat of asbestos in a perforated, tared crucible and wash thoroughly with hot distilled water, then with 10 cc. of alcohol and finally with 10 cc. of ether. Dry for 30 minutes at 100° C., cool in a desiccator and weigh. The weight of the cuprous oxide does not exceed 0.240 Gm.

Storage—Preserve Rice Polishings in well-closed containers and against attack by insects, page 5.

U. S. P. Product of Rice Polishings—Extractum Perpolitionum Oryzæ.

PETROLATUM

Petrolatum

Petrolat.—Petroleum Jelly

Petrolatum is a purified, semi-solid mixture of hydrocarbons obtained from petroleum.

Description—Petrolatum is an unctuous mass, varying in color from yellowish to light amber. It has not more than a slight fluorescence even after being melted, and is transparent in thin layers. It is free or nearly free from odor and taste.

Solubility—Petrolatum is insoluble in water. It is almost insoluble in cold or hot

alcohol, and in cold dehydrated alcohol. It is freely soluble in benzene, in carbon disulfide, in chloroform, and in oil of turpentine. It is soluble in ether, in purified benzine, and in most fixed and volatile oils, the degree of solubility in these solvents varying with the composition of the Petrolatum.

Specific gravity—The specific gravity of Petrolatum is not less than 0.815 and not more than 0.865 at 60° C.

Melting point—Petrolatum melts between 38° and 60° C., page 595, Class III.

Ash—Heat 2 Gm. of Petrolatum in an open porcelain or platinum dish over a Bunsen flame: it volatilizes without emitting an acrid odor, and on incineration leaves not more than 0.05 per cent of ash, page 556.

Organic acids—Weigh 20 Gm. of Petrolatum, add 100 cc. of a mixture of neutralized alcohol and distilled water (1 in 2), agitate thoroughly, and heat to boiling. Add 1 cc. of phenolphthalein T.S., and titrate rapidly with tenth-normal sodium hydroxide, with vigorous agitation, to a sharp pink end-point, noting the color change in the alcohol-water layer: not more than 0.4 cc. of tenth-normal sodium hydroxide is required.

Alkali—Introduce 35 Gm. of Petrolatum into a 250-cc. separatory funnel, add 100 cc. of boiling distilled water, and shake vigorously for 5 minutes. After the Petrolatum and water have separated, draw off the water into a casserole, and wash the Petrolatum in the separatory funnel with two 50-cc. portions of boiling distilled water, and add the washings to the casserole. To the accumulated 200 cc. of water add 1 drop of phenolphthalein T.S., and boil: the solution does not acquire a pink color.

Mineral acids—If the addition of phenolphthalein in the *test for alkali* produces no pink color, add 0.1 cc. of methyl orange T.S.: no red or pink color is produced.

Fixed oils, fats or rosin—Digest 10 Gm. of Petrolatum at 100° C. with 10 Gm. of sodium hydroxide and 50 cc. of distilled water for 30 minutes, then separate the aqueous layer, and add an excess of diluted sulfuric acid: no oily or solid matter separates.

Consistency—The consistency of Petrolatum is not less than 100 and not more than 275, page 566.

Color—Melt about 10 Gm. of Petrolatum on a water bath, and pour about 5 cc. of the liquid into a clear glass bacteriological test tube, 150 × 15 mm. Petrolatum is not darker than a solution made by mixing 3.8 cc. of ferric chloride C.S. and 1.2 cc. of cobaltous chloride C.S. in a similar tube, and comparing the two in reflected light against a white background, the Petrolatum tube being held at such an angle that there is no fluorescence.

Storage—Preserve Petrolatum in well-closed containers.

PETROLATUM ALBUM

White Petrolatum

Petrolat. Alb.—White Petroleum Jelly

White Petrolatum is petrolatum wholly or nearly decolorized.

Description—White Petrolatum is a white or faintly yellowish, unctuous mass, transparent in thin layers even after cooling to 0° C.

Color—Melt about 10 Gm. of White Petrolatum on a water bath, and pour 5 cc. of the liquid into a clear glass bacteriological test tube, 150 × 15 mm. White Petrolatum is not darker than a solution made by mixing 0.5 cc. of cupric sulfate C.S., 0.7 cc. of ferric chloride C.S., and 3.8 cc. of distilled water in a similar tube,

and comparing the two in reflected light against a white background, holding the White Petrolatum tube at such an angle that there is no fluorescence.

Other tests—In other respects White Petrolatum has the characteristics described under *Petrolatum*, page 351.

Storage—Preserve White Petrolatum in well-closed containers.

PETROLATUM LIQUIDUM

Liquid Petrolatum

Petrolat. Liq.—Liquid Paraffin, White Mineral Oil, Heavy Liquid Petrolatum

Liquid Petrolatum is a mixture of liquid hydrocarbons obtained from petroleum.

Description—Liquid Petrolatum is a colorless, transparent, oily liquid, free, or nearly free, from fluorescence. It is odorless and tasteless when cold, and develops not more than a faint odor of petroleum when heated.

Solubility—Liquid Petrolatum is insoluble in water and in alcohol. It is miscible with most fixed oils but not with castor oil. It is soluble in volatile oils. Camphor, menthol, thymol, and many similar substances are soluble in Liquid Petrolatum.

Specific gravity—The specific gravity of Liquid Petrolatum is not less than 0.860 and not more than 0.905 at 25° C.

Viscosity—Liquid Petrolatum has a kinematic viscosity of not less than 38.1 centistokes at 37.8° C., page 633.

Carbonizable substances—Place 5 cc. of Liquid Petrolatum in a glass-stoppered test tube which has been previously rinsed with chromic acid cleansing mixture, page 566, then rinsed with distilled water, and dried. Add 5 cc. of sulfuric acid containing from 94.5 per cent to 94.9 per cent of H_2SO_4 , and heat in a boiling water bath for 10 minutes. After the test tube has been in the bath for 30 seconds, remove it quickly, hold with the finger over the stopper, and give three vigorous, vertical shakes over an amplitude of about 5 inches. Repeat every 30 seconds. Do not keep the test tube out of the bath longer than 3 seconds for each shaking period. At the end of 10 minutes from the time when first placed in the water bath, remove the test tube: the Liquid Petrolatum remains unchanged in color and the acid does not become darker than the standard color produced by mixing in a similar test tube 3 cc. of ferric chloride C.S., 1.5 cc. of cobaltous chloride C.S., and 0.5 cc. of cupric sulfate C.S., this mixture being overlaid with 5 cc. of Liquid Petrolatum.

Reaction—Boil 10 cc. of Liquid Petrolatum with an equal volume of neutralized alcohol: the alcohol remains neutral to moistened litmus paper.

Solid paraffin—Fill a tall, cylindrical, standard oil-sample bottle of colorless glass of about 120-cc. capacity with Liquid Petrolatum, which has been dried previously in a beaker at 100° C. for 2 hours and cooled to room temperature in a desiccator over sulfuric acid. Stopper, and immerse the bottle in a mixture of ice and distilled water for 4 hours: the Liquid Petrolatum is sufficiently clear that a black line 0.5 mm. in width, held vertically behind the sample bottle, is easily seen.

Sulfur compounds—Prepare a saturated solution of lead monoxide in an aqueous solution of sodium hydroxide (1 in 5), and mix 2 drops of the clear solution with 4 cc. of Liquid Petrolatum and 2 cc. of dehydrated alcohol: the mixture does not darken after heating at 70° C. for 10 minutes and cooling.

Storage—Preserve Liquid Petrolatum in well-closed containers, protected from light.

U. S. P. Product of Liquid Petrolatum—Emulsum Petrolati Liquidi.

AVERAGE DOSE—Metric, 15 cc.—Apothecaries, 4 fluidrachms.

PETROLATUM LIQUIDUM LEVE

Light Liquid Petrolatum

Petrolat. Liq. Lev.—Light Liquid Paraffin, Light White Mineral Oil

Light Liquid Petrolatum is a mixture of liquid hydrocarbons obtained from petrolatum.

Viscosity—Light Liquid Petrolatum has a kinematic viscosity of not more than 37 centistokes at 37.8° C., page 633.

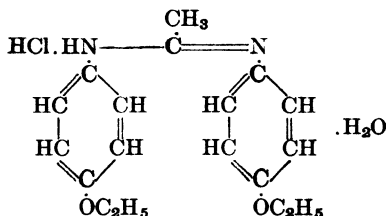
Specific gravity and other tests—With the exception of the specific gravity, which is not less than 0.828 and not more than 0.880 at 25° C., Light Liquid Petrolatum conforms to the *description* and *solubility*, and meets the requirements of the *other tests*, and for *storage* under *Petrolatum Liquidum*, page 353.

Storage—Preserve Light Liquid Petrolatum in well-closed containers, protected from light.

PHENACAINÆ HYDROCHLORIDUM

Phenacaine Hydrochloride

Phenacain. Hydrochlor.



$C_{18}H_{22}N_2O_2 \cdot HCl \cdot H_2O$

Mol. wt. 352.85

Phenacaine Hydrochloride, when dried at 105° C. for 6 hours, contains not less than 87.5 per cent and not more than 90.5 per cent of phenacaine base ($C_{18}H_{22}N_2O_2$).

Description—Phenacaine Hydrochloride occurs as small, white crystals. It is odorless, has a faintly bitter taste, producing transient numbness of the tongue, and is permanent in air.

Solubility—One Gm. of Phenacaine Hydrochloride dissolves in 50 cc. of water at 25° C. It is freely soluble in alcohol and in chloroform, and is insoluble in ether.

Melting point—When dried to constant weight at 105° C., Phenacaine Hydrochloride does not melt below 190° C., page 595.

Identification—

- A: To 5 cc. of a saturated aqueous solution of Phenacaine Hydrochloride add a few drops of sodium hypochlorite T.S.: a flesh colored precipitate is formed which changes in a few minutes to a violet color. When the mixture is shaken with ether, the ether becomes deep red.
- B: An aqueous solution of Phenacaine Hydrochloride (1 in 100) responds to the test for chloride, page 589.
- C: The base obtained in the *assay*, when recrystallized from hot alcohol and dried at 105° C. for 1 hour, melts between 116° and 118° C., page 595.

Loss on drying—When dried at 105° C. for 6 hours, Phenacaine Hydrochloride loses not more than 7 per cent of its weight.

Ash—Phenacaine Hydrochloride yields not more than 0.15 per cent of ash, page 556.

Acetophenetidin—Dissolve 50 mg. of Phenacaine Hydrochloride in 2 cc. of hydrochloric acid, boil for 2 minutes, cool, and add 1 drop of potassium dichromate T.S.: no ruby red color is produced.

Reaction—An aqueous solution of Phenacaine Hydrochloride (1 in 50) is neutral to litmus paper.

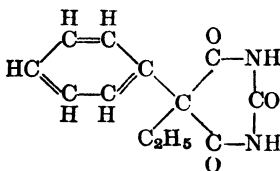
Assay—To about 25 cc. of distilled water and 5 cc. of ammonia T.S. contained in a separator, add about 0.5 Gm. of Phenacaine Hydrochloride, previously dried at 105° C. for 6 hours and accurately weighed. Extract this solution with four successive portions of 15, 10, 10, and 10 cc. of chloroform. Pass the chloroform extracts through a pledget of purified cotton in a small funnel into a tared beaker, and wash the cotton and funnel with a few cc. of chloroform. Cautiously evaporate the chloroform, adding 5 cc. of alcohol just before the last of the chloroform is expelled. Evaporate the alcohol, and dry the residue to constant weight at 105° C.: the weight of the base is not less than 87.5 and not more than 90.5 per cent of the weight of the dried Phenacaine Hydrochloride taken for the assay.

Storage—Preserve Phenacaine Hydrochloride in well-closed containers.

PHENOBARBITALUM

Phenobarbital

Phenobarb.—Phenylethylmalonylurea, Phenobarbitone



$C_{12}H_{12}N_2O_3$

Mol. wt. 232.23

Description—Phenobarbital occurs as white, odorless, glistening, small crystals, or as a white, crystalline powder. It is stable in air.

Solubility—One Gm. of Phenobarbital dissolves in about 1000 cc. of water, in 10 cc. of alcohol, in about 40 cc. of chloroform, and in 15 cc. of ether, at 25° C. It is soluble in solutions of fixed alkali hydroxides or carbonates.

Melting point—Phenobarbital melts between 174° and 178° C., page 595.

Identification—

A: Boil about 0.2 Gm. of Phenobarbital with 10 cc. of sodium hydroxide T.S.: ammonia is evolved.

B: Shake about 0.3 Gm. of Phenobarbital for 2 minutes with 1 cc. of normal sodium hydroxide and 5 cc. of distilled water, filter, and divide the filtrate into two portions. To one portion add mercuric nitrate T.S.: a white precipitate is produced, which is soluble in ammonia T.S. To the other portion add silver nitrate T.S. a few drops at a time: a white precipitate is produced, which at first redissolves but becomes insoluble when an excess of silver nitrate has been added.

Distinction from barbitol—In a large, dry test tube mix 0.2 Gm. of Phenobarbital, 0.5 Gm. of potassium nitrate, and 2 cc. of sulfuric acid, and immerse the test tube in a bath of boiling water for 20 minutes. Cool the mixture, add 3 cc. of distilled water, and cautiously add ammonia T.S. until the mixture is distinctly alkaline. Boil the mixture until the evolution of nitrogen ceases, cool, and add, without mixing, 2 drops of colorless ammonium sulfide T.S.: a brown red ring is formed,

which gradually diffuses to give an orange red precipitate. No colored ring or precipitate is formed by barbitol.

Loss on drying—When dried over sulfuric acid for 18 hours, Phenobarbital loses not more than 1 per cent of its weight.

Ash—Phenobarbital yields not more than 0.15 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.5 Gm. of Phenobarbital in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—A saturated aqueous solution of Phenobarbital is acid to litmus paper.

Phenylbarbituric acid—Boil 2 Gm. of Phenobarbital with 10 cc. of alcohol under a reflux condenser during 3 minutes: a clear and complete solution results.

Storage—Preserve Phenobarbital in well-closed containers.

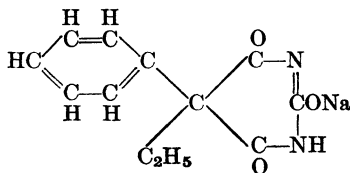
U. S. P. Products of Phenobarbital—Tabellæ Phenobarbitali, Elixir Phenobarbitali.

AVERAGE DOSE—Metric, 30 mg.—Apothecaries, $\frac{1}{2}$ grain.

PHENOBARBITALUM SODICUM

Phenobarbital Sodium

Phenobarb. Sod.—Phenobarbitalum Solubile U. S. P. XI, Soluble Phenobarbital, Soluble Phenobarbitone



$C_{12}H_{11}N_2O_3Na$

Mol. wt. 254.22

Phenobarbital Sodium contains not less than 89 per cent and not more than 91.5 per cent of phenobarbital ($C_{12}H_{12}N_2O_3$), calculated on a moisture-free basis, the moisture being determined on a separate portion by drying at 140° C. for 6 hours.

Description—Phenobarbital Sodium occurs as flaky crystals, as white, crystalline granules, or as a white powder. It is odorless, has a bitter taste, and is hygroscopic.

Solubility—Phenobarbital Sodium is very soluble in water, soluble in alcohol, but practically insoluble in ether and in chloroform.

Identification—

- A: Add a slight excess of diluted hydrochloric acid to 5 cc. of an aqueous solution of Phenobarbital Sodium (1 in 10): a white precipitate of phenobarbital is produced.
- B: The residue of phenobarbital, obtained in the *assay*, melts between 174° and 178° C., page 595, and responds to *identification tests A and B* and the test for *distinction from barbitol* under *Phenobarbitalum*, page 355.
- C: Ignite about 0.5 Gm. of Phenobarbital Sodium: the residue, when moistened with distilled water, effervesces upon the addition of dilute hydrochloric acid, and responds to the test for sodium, page 592.

Loss on drying—Dry about 1 Gm. of Phenobarbital Sodium, accurately weighed, at 140° C. for 6 hours: the loss in weight does not exceed 7 per cent.

Carbonizable substances—Dissolve 0.5 Gm. of Phenobarbital Sodium in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—An aqueous solution of Phenobarbital Sodium is alkaline to litmus paper and to phenolphthalein T.S.

Chloride, sulfate—Dissolve about 0.5 Gm. of Phenobarbital Sodium in 50 cc. of distilled water, add 5 cc. of diluted nitric acid, and filter: separate 10-cc. portions of the filtrate show no opalescence at once upon the addition of silver nitrate T.S., or upon the addition of barium nitrate T.S.

Heavy metals—Dissolve 2 Gm. of Phenobarbital Sodium in 42 cc. of distilled water. Add slowly, with vigorous stirring, 8 cc. of normal hydrochloric acid, and filter, rejecting the first 5 cc. of the filtrate: the heavy metals limit, page 586, for Phenobarbital Sodium, determined in 25 cc. of the filtrate, is 30 parts per million.

Free phenobarbital—Shake 0.5 Gm. of Phenobarbital Sodium with 20 cc. of absolute ether, filter, evaporate the filtrate to dryness in a tared dish, and dry the residue at 100° C. for 1 hour: the residue weighs not more than 3 mg.

Assay—Dissolve about 0.5 Gm. of Phenobarbital Sodium, accurately weighed, in 50 cc. of distilled water in a separator. Add 10 cc. of diluted hydrochloric acid, and completely extract the liberated phenobarbital with successive portions of 25 cc. each of ether. Wash the combined ether extracts with two 5-cc. portions of distilled water, evaporate the ether in a tared dish, and dry the residue to constant weight at 100° C. The weight of phenobarbital ($C_{12}H_{12}N_2O_3$) so obtained, corresponds to not less than 89 per cent and not more than 91.5 per cent of the Phenobarbital Sodium taken, calculated on a moisture-free basis.

Storage—Preserve Phenobarbital Sodium in tight containers.

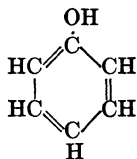
U. S. P. Product of Phenobarbital Sodium—Tabellæ Phenobarbitali Sodici.

AVERAGE DOSE—Metric, 30 mg.—Apothecaries, $\frac{1}{2}$ grain.

PHENOL

Phenol

Carbolic Acid



C_6H_5O

Mol. wt. 94.11

Phenol contains not less than 98 per cent of C_6H_5O .

Description—Phenol occurs as colorless to light pink, interlaced, or separate, needle-shaped crystals, or as a white or light pink, crystalline mass. It has a characteristic odor. When undiluted, it whitens and cauterizes the skin and mucous membranes. When gently heated, Phenol melts, forming a highly refractive liquid. It is also liquefied by the addition of 10 per cent of water. Its vapor is inflammable. Phenol gradually darkens on exposure to light and air.

Solubility—One Gm. of Phenol dissolves in 15 cc. of water at 25° C. It is very soluble in alcohol, in glycerin, in chloroform, in ether, and in fixed and volatile oils. It is soluble in petrolatum and in liquid petrolatum.

Congeaing temperature—Phenol congeals at a temperature not lower than 39° C., page 566.

Identification—

A: An aqueous solution of Phenol yields with bromine T.S. a white precipitate which at first redissolves, but becomes permanent as more of the reagent is added.

B: Add 1 drop of ferric chloride T.S. to 10 cc. of an aqueous solution of Phenol (1 in 100): the liquid acquires a violet blue color.

Non-volatile residue—Heat about 5 Gm. of Phenol, accurately weighed, in a tared porcelain dish, on a water bath until it is volatilized, and dry at 105° C. for 1 hour: not more than 0.05 per cent of residue remains.

Reaction—An aqueous solution of Phenol (1 in 15) is clear, and neutral or only faintly acid to litmus paper.

Assay—Dissolve about 1.5 Gm. of Phenol, accurately weighed, in sufficient distilled water to make 1000 cc. of solution. Transfer an aliquot of the solution, containing from 38 to 41 mg. of Phenol, to an iodine flask, add 30 cc. of tenth-normal bromine, then 5 cc. of hydrochloric acid, and immediately insert the stopper. Shake the flask repeatedly during 30 minutes, allow it to stand for 15 minutes, remove the stopper just sufficiently to introduce quickly 5 cc. of an aqueous solution of potassium iodide (1 in 5), being careful that no bromine vapor escapes, and at once stopper the flask. Shake thoroughly, remove the stopper, and rinse it and the neck of the flask with a little distilled water, so that the washings may flow into the flask. Add 1 cc. of chloroform, shake the mixture well, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal bromine is equivalent to 0.001569 Gm. of C_6H_6O .

Storage—Preserve Phenol in tight, light-resistant containers.

U. S. P. Products of Phenol—Phenol Liquefactum, Unguentum Phenolis.

PHENOL LIQUEFACTUM

Liquefied Phenol

Phenol Liq.—Liquefied Carbolic Acid

Liquefied Phenol is phenol maintained in the liquid condition by the presence of 10 per cent of distilled water. It contains not less than 88 per cent of C_6H_6O .

Liquefied Phenol may be prepared by the following method.

PHENOL, a convenient quantity,

DISTILLED WATER, a sufficient quantity.

Liquefy the phenol by placing the unstoppered container in a water bath and applying heat gradually. Transfer the liquid to a tared vessel, weigh, add 1 Gm. of distilled water for each 9 Gm. of Phenol, and mix thoroughly.

Note—When phenol is to be mixed with a fixed oil, liquid petrolatum, or petrolatum, melted crystalline Phenol, page 357, should be used instead of Liquefied Phenol.

Description—Liquefied Phenol is a colorless liquid, which may develop a red tint upon exposure to air or light. It has a characteristic, somewhat aromatic odor.

When undiluted, it whitens and cauterizes the skin and mucous membranes.

Solubility—Liquefied Phenol is miscible with alcohol, with ether, and with glycerin.

A mixture of Liquefied Phenol and an equal volume of glycerin is miscible with water.

Specific gravity—The specific gravity of Liquefied Phenol is about 1.065 at 25° C. **Boiling point**—When subjected to distillation, the boiling point of Liquefied Phenol does not rise above 182° C., page 559.

Other requirements—In other respects Liquefied Phenol responds to the tests for *identification* and for *non-volatile residue* as described under *Phenol*, page 357.

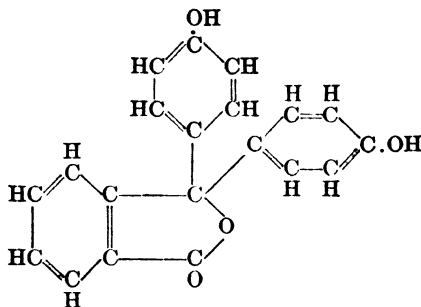
Assay—Proceed as directed under *Phenol*, page 357.

Storage—Preserve in well-closed, tight, light-resistant containers.

PHENOLPHTHALEINUM

Phenolphthalein

Phenolphthal.



$C_{20}H_{14}O_4$

Mol. wt. 318.31

Description—Phenolphthalein occurs as a white or faintly yellowish white, crystalline powder. It is odorless, and is stable in air.

Solubility—Phenolphthalein is almost insoluble in water. One Gm. of it dissolves in 15 cc. of alcohol, and in 75 cc. of ether, at 25° C.

Melting point—The melting point of Phenolphthalein is not lower than 258° C., page 595.

Identification—Phenolphthalein is readily dissolved by solutions of alkali hydroxides and by hot solutions of alkali carbonates, yielding red liquids. These solutions are decolorized by the addition of an excess of acid.

Loss on drying—When dried over sulfuric acid for 18 hours, Phenolphthalein loses not more than 1 per cent of its weight.

Ash—Phenolphthalein yields not more than 0.1 per cent of ash, page 556.

Arsenic—Heat a platinum crucible to redness, and add, in small portions, an intimate mixture of 0.2 Gm. of Phenolphthalein, 0.5 Gm. of potassium nitrate, and about 0.3 Gm. of anhydrous sodium carbonate. Maintain the mixture at a red heat until the reaction ceases, then boil the cooled residue with 10 cc. of diluted sulfuric acid for 5 minutes, filter, and wash the undissolved residue with 10 cc. of distilled water. Evaporate the filtrate and washings until sulfur trioxide vapors are evolved: the residue, dissolved in 5 cc. of distilled water, meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Heat 0.5 Gm. of Phenolphthalein with 10 cc. of diluted hydrochloric acid on a water bath for 5 minutes, filter, and evaporate the filtrate to dryness. Add to the residue 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc.

with distilled water: the heavy metals limit, page 586, for Phenolphthalein is 15 parts per million.

Colored substances—A solution of 0.5 Gm. of Phenolphthalein in 30 cc. of neutral alcohol is colorless.

Fluorane—One-half Gm. of Phenolphthalein dissolves completely in a mixture of 4 cc. of sodium hydroxide T.S. and 50 cc. of distilled water.

Sensitiveness—A mixture of 50 cc. of cold, recently boiled, distilled water and 0.5 cc. of an alcoholic solution of Phenolphthalein (1 in 100) requires not more than 0.25 cc. of fiftieth-normal sodium hydroxide to produce a pink color.

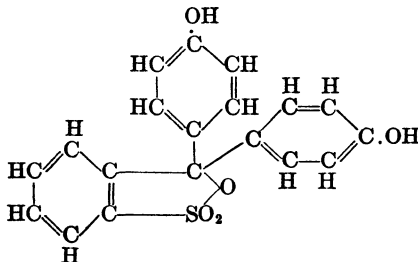
Storage—Preserve Phenolphthalein in well-closed containers.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

PHENOLSULFONPHTHALEINUM

Phenolsulfonphthalein

Phenolsulfonphthal.—Phenol Red



Description—Phenolsulfonphthalein occurs as a crystalline powder, varying in color from bright to dark red. It is stable in air.

Solubility—One Gm. of Phenolsulfonphthalein dissolves in about 1300 cc. of water and in about 350 cc. of alcohol. It is almost insoluble in chloroform and in ether.

Identification—

A: Phenolsulfonphthalein is readily soluble in solutions of alkali hydroxides and carbonates, in ammonia water, and in solution of ammonium carbonate, with colors varying from deep red in concentrated solutions to a violet tinted red in dilute solutions. The red color of these solutions is changed to orange or yellow by the addition of a slight excess of acid.

B: Dissolve about 5 mg. of phenolsulfonphthalein in a few drops of sodium hydroxide T.S., add 2 cc. of tenth-normal bromine and 1 cc. of diluted hydrochloric acid, shake well, and allow to stand for 5 minutes. Make the solution alkaline with sodium hydroxide T.S.: an intense blue violet color is produced.

Loss on drying—When dried over sulfuric acid for 18 hours, Phenolsulfonphthalein loses not more than 1 per cent of its weight.

Ash—Phenolsulfonphthalein yields not more than 0.2 per cent of ash, page 556.

Arsenic—Heat a platinum crucible to redness, and add, in small portions, an intimate mixture of 0.2 Gm. of Phenolsulfonphthalein, about 0.5 Gm. of potassium nitrate and about 0.3 Gm. of anhydrous sodium carbonate. Maintain the mixture at a red heat until the reaction ceases, boil the cooled residue for 5 minutes with 10 cc. of diluted sulfuric acid, filter, and wash the undissolved residue with 10 cc. of distilled water. Evaporate the filtrate and washings until sulfur trioxide vapors are evolved: the residue, dissolved in 5 cc. of distilled water, meets the requirements of the test for arsenic, page 554.

Insoluble substances—To about 1 Gm. of Phenolsulfonphthalein, accurately weighed, add a filtered solution of 0.5 Gm. of sodium bicarbonate in 20 cc. of distilled water. Rotate the container frequently during 1 hour, dilute to 100 cc., and allow it to stand over night. Filter through counter-balanced filters or a tared filtering crucible, wash first with 25 cc. of a 1 per cent solution of sodium bicarbonate, then with 25 cc. of distilled water, and dry to constant weight at 110° C.: the weight of the insoluble residue does not exceed 0.2 per cent of the weight of Phenolsulfonphthalein taken.

Sensitiveness—Fill a 100-cc. glass-stoppered flask with thoroughly boiled and cooled distilled water to within a few cc. of the stopper. Add 1 cc. of an alcoholic solution of Phenolsulfonphthalein (1 in 1000) and 0.5 cc. of fiftieth-normal sodium hydroxide, stopper the flask immediately, and mix well: the mixture is intensely red.

Storage—Preserve Phenolsulfonphthalein in well-closed containers.

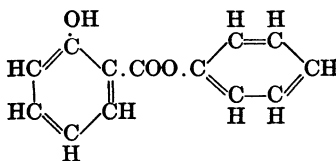
U. S. P. Product of Phenolsulfonphthalein—Injectio Phenolsulfonphthaleini.

AVERAGE DOSE—Intramuscular or intravenous, Metric, 6 mg.—
Apothecaries, $\frac{1}{10}$ grain as the sodium salt.

PHENYLIS SALICYLAS

Phenyl Salicylate

Phenyl. Salicyl.—Salol



$C_{13}H_{10}O_2$

Mol. wt. 214.21

Description—Phenyl Salicylate occurs as a white, crystalline powder, having a characteristic odor and taste.

Solubility—One Gm. of Phenyl Salicylate dissolves in about 6700 cc. of water and in 6 cc. of alcohol, at 25° C. It is very soluble in chloroform, in ether, and in fixed and volatile oils.

Melting point—Phenyl Salicylate melts between 41° and 43° C., page 595.

Identification—

A: Heat about 0.3 Gm. of Phenyl Salicylate with 3 cc. of sodium hydroxide T.S. for a few minutes, and acidify the solution with hydrochloric acid: salicylic acid separates and the odor of phenol is recognizable.

B: The addition of ferric chloride T.S., well diluted with water, to an alcoholic solution of Phenyl Salicylate (1 in 20) produces a violet color.

Loss on drying—When dried over sulfuric acid for 18 hours, Phenyl Salicylate loses not more than 1 per cent of its weight.

Ash—Phenyl Salicylate yields not more than 0.1 per cent of ash, page 556.

Free acid—Phenyl Salicylate does not redden moistened blue litmus paper.

Free phenol or salicylic acid—Shake 1 Gm. of Phenyl Salicylate with 50 cc. of distilled water, and filter the liquid: the addition of 1 drop of ferric chloride T.S. to 10 cc. of the filtrate produces no violet color.

Chloride, sulfate—Ten-cc. portions of the filtrate prepared for the preceding test,

when tested, respectively, with silver nitrate T.S. and barium chloride T.S., show no turbidity.

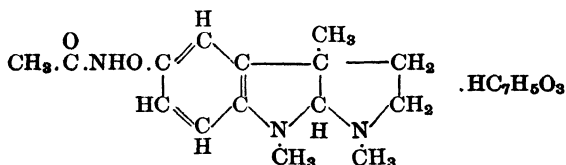
Storage—Preserve Phenyl Salicylate in tight containers at a temperature not above 35° C.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

PHYSOSTIGMINÆ SALICYLAS

Physostigmine Salicylate

Physostig. Salicyl.—Eserine Salicylate



$C_{15}H_{21}N_3O_2 \cdot HC_7H_5O_3$

Mol. wt. 413.46

Physostigmine Salicylate is the salicylate of an alkaloid usually obtained from the dried ripe seed of *Physostigma venenosum* Balfour (Fam. *Leguminosæ*).

Description—Physostigmine Salicylate occurs as white or faintly yellow, shining, odorless crystals. It acquires a red tint when long exposed to light and air.

Caution—*Physostigmine Salicylate is extremely poisonous.*

Solubility—One Gm. of Physostigmine Salicylate dissolves in 75 cc. of water, in 16 cc. of alcohol, in 6 cc. of chloroform, and in about 250 cc. of ether, at 25° C.

Identification—

A: Evaporate about 5 mg. of Physostigmine Salicylate on a water bath with a few drops of ammonia T.S.: a blue residue remains which, when dissolved in alcohol, yields a red, fluorescent solution upon the addition of an excess of acetic acid.

B: Add a few drops of sodium hydroxide T.S. to 5 cc. of a cold, saturated aqueous solution of Physostigmine Salicylate: a pink color rapidly develops.

C: Ferric chloride T.S. produces a deep violet color in an aqueous solution of Physostigmine Salicylate.

Loss on drying—When dried over sulfuric acid for 18 hours, Physostigmine Salicylate loses not more than 2 per cent of its weight.

Ash—The ash from 0.1 Gm. of Physostigmine Salicylate is negligible, page 556.

Reaction—A cold, saturated aqueous solution of Physostigmine Salicylate is neutral or only faintly acid to litmus paper.

Carbonizable substances—Dissolve 0.1 Gm. of Physostigmine Salicylate in 5 cc. of sulfuric acid: the solution, after standing for 5 minutes, has no more color than matching fluid I, page 563.

Sulfate—Precipitate the salicylic acid from 10 cc. of a cold, saturated aqueous solution of Physostigmine Salicylate with a slight excess of diluted hydrochloric acid, and filter: the filtrate is not rendered turbid at once by the addition of 5 drops of barium chloride T.S.

Storage—Preserve Physostigmine Salicylate in tight, light-resistant containers which hold not more than 1 Gm.

AVERAGE DOSE—Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain.

PICROTOXINUM

Picrotoxin

Picrotox.—Cocculin

Picrotoxin is a glycoside obtained from the seed of *Anamirta paniculata* Colebrooke (Fam. *Menispermaceæ*).

Description—Picrotoxin occurs as flexible, shining, prismatic crystals or as a micro-crystalline powder. It is odorless, and stable in air, but is affected by light.

Solubility—One Gm. of Picrotoxin dissolves in about 350 cc. of water at 25° C., in about 5 cc. of boiling water, and in about 3 cc. of boiling alcohol. It is more readily soluble in diluted acids and alkalies. It is sparingly soluble in ether and in chloroform.

Melting point—Picrotoxin melts between 198° and 200° C., page 595.

Identification—

A: Concentrated sulfuric acid dissolves Picrotoxin, forming a golden yellow solution which changes gradually to reddish brown.

B: Mix about 0.2 Gm. of sodium nitrate with 3 or 4 drops of sulfuric acid in a suitable porcelain dish. Sprinkle a few particles of Picrotoxin on the mixture, add sodium hydroxide solution (1 in 4) dropwise until it is in excess: the particles of Picrotoxin acquire a red color which gradually fades.

C: Dilute 2 cc. of alkaline cupric tartrate T.S. with 10 cc. of distilled water, and add a few particles of Picrotoxin: a red precipitate forms slowly in the cold, but rapidly upon boiling.

Ash—The ash from 0.2 Gm. of Picrotoxin is negligible, page 556.

Reaction—A saturated, aqueous solution of Picrotoxin is neutral to litmus paper.

Alkaloids—A saturated, aqueous solution of Picrotoxin yields no precipitate with platinic chloride T.S., tannic acid T.S., or mercuric potassium iodide T.S.

Storage—Preserve Picrotoxin in well-closed, light-resistant containers.

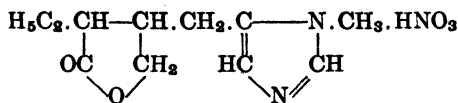
U. S. P. Product of Picrotoxin—Injectio Picrotoxini.

AVERAGE DOSE—Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain—
more, depending on the severity of the barbiturate poisoning.

PILOCARPINÆ NITRAS

Pilocarpine Nitrate

Pilocarpin. Nitras



$\text{C}_{11}\text{H}_{16}\text{N}_2\text{O}_2 \cdot \text{HNO}_3$

Mol. wt. 271.27

Pilocarpine Nitrate is the nitrate of an alkaloid obtained from the dried leaflets of *Pilocarpus Jaborandi* Holmes, or of *Pilocarpus microphyllus* Stapf (Fam. *Rutaceæ*).

Description—Pilocarpine Nitrate occurs as shining, white crystals. It is stable in air but is affected by light.

Solubility—One Gm. of Pilocarpine Nitrate dissolves in 4 cc. of water and in 75 cc. of alcohol, at 25° C. It is insoluble in chloroform and in ether.

Melting point—Pilocarpine Nitrate melts between 170° and 173° C., page 595.

Identification—

A: Dissolve about 15 mg. of Pilocarpine Nitrate in 2 cc. of distilled water in a test tube, add 2 cc. of faintly acid hydrogen peroxide T.S., and cover the mixture with about 1 cc. of benzene. Add 3 or 4 drops of a solution of potassium dichromate (1 in 300), and shake the mixture gently: the benzene layer acquires a violet color, while the aqueous layer remains yellow.

B: Mix an aqueous solution of Pilocarpine Nitrate (1 in 10) with an equal volume of ferrous sulfate T.S., and superimpose the mixture upon 5 cc. of sulfuric acid, contained in a test tube: the zone of contact becomes brown.

Loss on drying—When dried over sulfuric acid for 18 hours, Pilocarpine Nitrate loses not more than 2 per cent of its weight.

Ash—The ash from 0.2 Gm. of Pilocarpine Nitrate is negligible, page 556.

Carbonizable substances—Dissolve 0.1 Gm. of Pilocarpine Nitrate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—An aqueous solution of Pilocarpine Nitrate (1 in 20) is slightly acid to litmus paper.

Chloride—Add a few drops of silver nitrate T.S. to 5 cc. of an aqueous solution of Pilocarpine Nitrate (1 in 50), acidified with nitric acid: no opalescence is produced at once.

Various foreign alkaloids—Add ammonia T.S. or potassium dichromate T.S. to 10 cc. of an aqueous solution of Pilocarpine Nitrate (1 in 100): the mixture is not turbid.

Storage—Preserve Pilocarpine Nitrate in tight, light-resistant containers.

AVERAGE DOSE—Metric, 5 mg.—Apothecaries, $\frac{1}{12}$ grain.

PILULÆ FERRI CARBONATIS

Pills of Ferrous Carbonate

Pil. Ferr. Carb.—Chalybeate Pills, Blaud's Pills, Ferruginous Pills

Each Pill contains not less than 60 mg. of FeCO_3 .

FERROUS SULFATE, in clear crystals.....	16 Gm.
POTASSIUM CARBONATE.....	8 Gm.
SUCROSE, finely powdered.....	4 Gm.
TRAGACANTH, finely powdered.....	1 Gm.
ALTHEA, in very fine powder.....	1 Gm.
GLYCERIN, a sufficient quantity,	
DISTILLED WATER, a sufficient quantity,	

To make..... 100 pills

Triturate the potassium carbonate in a mortar with a sufficient quantity (about 5 drops) of glycerin, add the ferrous sulfate and su-

crose, previously triturated together to a uniform, fine powder, and mix the mass thoroughly until it assumes a greenish color. When the reaction is complete, incorporate the tragacanth and althea, and add distilled water, if necessary, to obtain a mass of pilular consistence. Divide it into 100 pills.

Assay—Carefully pulverize 5 Pills in a mortar, and triturate with 20 cc. of diluted sulfuric acid until all carbonate is dissolved. Transfer completely the contents of the mortar to a beaker of about 800 cc. capacity, and add distilled water to bring the total volume to approximately 300 cc. Add 0.1 cc. of orthophenanthroline T.S., and titrate immediately with tenth-normal ceric sulfate, avoiding excessive stirring. Near the end of the titration tilt the beaker at an angle of 45° to facilitate the detection of the end-point. Each cc. of tenth-normal ceric sulfate is equivalent to 0.01159 Gm. of FeCO_3 .

Storage—Preserve Pills of Ferrous Carbonate in well-closed containers.

AVERAGE DOSE—5 pills.

PITUITARIUM POSTERIUS

Posterior Pituitary

Pituitar. Post.—Pituitary, Hypophysis Sicca.

Posterior Pituitary is the cleaned, dried, and powdered posterior lobe obtained from the pituitary body of domesticated animals which are used for food by man. The pituitary body must be removed from the animal immediately after slaughtering and then dried at once or kept frozen until dried. The potency of Posterior Pituitary shall be such that 1 mg. shall possess an activity equivalent to not less than 1 U. S. P. Posterior Pituitary Unit.*

Description—Posterior Pituitary occurs as a yellowish or grayish, amorphous powder and has a characteristic odor.

Solubility—Posterior Pituitary is only partially soluble in water.

Assay—Carefully weigh a suitable amount of Posterior Pituitary and prepare a solution from it, following the directions given for preparation of a solution of the Posterior Pituitary Reference Standard (page 607). Assay this solution against a solution of the Posterior Pituitary Reference Standard as directed under the assay for *Injectio Pituitarii Posterioris*, page 244.

Storage—Preserve Posterior Pituitary in well-closed containers, preferably at a temperature not above 30° C.

U. S. P. Product of Posterior Pituitary—*Injectio Pituitarii Posterioris*.

* The potency of 0.5 mg. of the U. S. P. Posterior Pituitary Reference Standard represents 1 U. S. P. Unit.

PIX JUNIPERI

Juniper Tar

Pix Junip.—Oil of Cade, Oleum Juniperi Empyreumaticum

Juniper Tar is the empyreumatic volatile oil obtained from the woody portions of *Juniperus Oxycedrus* Linné (Fam. *Pinaceæ*).

Description—Juniper Tar is a dark brown, clear, thick liquid, having a tarry odor, and a warm, faintly aromatic, bitter taste.

Solubility—Juniper Tar is very slightly soluble in water. It is only partially soluble in petroleum benzin, but is soluble in 9 volumes of alcohol, and in all proportions in amyl alcohol, chloroform, and glacial acetic acid. It is almost completely soluble in 3 volumes of ether with not more than a slight, flocculent residue.

Specific gravity—The specific gravity of Juniper Tar is not less than 0.950 and not more than 1.055 at 25° C.

Identification—Shake 1 part of Juniper Tar with 20 parts of warm distilled water and filter the mixture.

A: A 5-cc. portion of the filtrate blackens silver ammonium nitrate T.S. in the cold.

B: Another 5-cc. portion of the filtrate gives a red precipitate with alkaline cupric tartrate T.S. on heating.

Reaction—The filtrate prepared for the identification tests imparts an acid reaction to moistened blue litmus paper.

Rosin or rosin oils—Triturate 1 cc. of Juniper Tar with 15 cc. of purified benzin, filter the solution, add an equal volume of cupric acetate solution (1 in 100), shake, and allow the liquids to separate. Decant the benzin layer into a test tube, and add to it an equal volume of ether: the liquid does not become intensely green, and is not darker than light yellow to brown.

Storage—Preserve Juniper Tar in tight, light-resistant containers and avoid exposure to excessive heat.

PIX PINI

Pine Tar

Pix Pin.—Pix Liquida

Pine Tar is a product obtained by the destructive distillation of the wood of *Pinus palustris* Miller, or of other species of *Pinus* (Fam. *Pinaceæ*).

Description—Pine Tar is a very viscid, blackish brown, non-crystalline liquid. It is translucent in thin layers, but becomes granular and opaque with age. It has an empyreumatic, terebinthinate odor, a sharp, empyreumatic taste, and is more dense than water.

Solubility—Pine Tar is miscible with alcohol, ether, chloroform, glacial acetic acid, and with fixed and volatile oils. It is slightly soluble in water, the solution being pale yellowish to yellowish brown.

Identification—Shake about 1 cc. of Pine Tar with 10 cc. of distilled water for 10 minutes, filter, and add 1 drop of ferric chloride T.S. to the filtrate: the mixture has a green color which rapidly changes to brown.

Reaction—An aqueous solution of Pine Tar is acid to litmus paper.

Ash—Pine Tar yields not more than 0.3 per cent of ash, page 556.

Storage—Preserve Pine Tar in well-closed containers.

U. S. P. Products of Pine Tar—Oleum Picis Rectificatum, Unguentum Picis Pini.

PLASMA HUMANUM NORMALE CITRATUM

Citrated Normal Human Plasma

Plas. Human. Nor. Citr.—Normal Human Plasma

Citrated Normal Human Plasma is the sterile plasma obtained by pooling approximately equal amounts of the liquid portion of citrated whole blood from eight or more humans (*Homo sapiens*) who have been certified by a qualified doctor of medicine as free from any disease which is transmissible by blood transfusion at the time of drawing the blood. Each bleeding is drawn under aseptic precautions into individual sterile centrifuge bottles already containing 50 cc. of a sterile, 4 per cent solution of sodium citrate in isotonic solution of sodium chloride for each 500 cc. of whole blood. The cell-free plasma is separated by centrifugation, and transferred to a pool by means of a closed system. Sterility tests are made, a preservative is added, and the plasma is distributed into final containers through a closed system. Citrated Normal Human Plasma complies with the requirements of the National Institute of Health of the United States Public Health Service.

Citrated Normal Human Plasma may be dispensed as liquid plasma, as frozen plasma, or as dried plasma. Citrated Normal Human Plasma must be free from harmful substances detectable by animal inoculation, and must not contain an excessive amount of preservative.

Description—(a) *Liquid plasma*: Freshly collected citrated human plasma is a slightly opalescent liquid of a faint yellowish or amber color and practically odorless in the absence of a preservative possessing an odor; it contains no visible particles and is free of cellular elements save for a variable number of blood platelets. Increased opalescence or a precipitate of fibrin may develop on standing. As a stabilizing agent, not more than 10 per cent of dextrose in the form of *Injectio Dextrosi* (50 per cent dextrose) may be added.

(b) *Frozen plasma*: This is made from citrated liquid normal human plasma, frozen quickly, within 72 hours of bleeding. As a stabilizing agent, not more than 10 per cent of dextrose in the form of *Injectio Dextrosi* (50 per cent dextrose), page 226, may be added before freezing. The plasma should be manipulated while freezing so as to avoid formation of a solid mass. It is imperative that frozen plasma be kept continuously in the frozen state until liquefied by placing in a water bath at 37° C.

(c) *Dried plasma*: This is made from frozen plasma without added dextrose by drying from the frozen state under vacuum. It contains not more than 1 per cent of moisture as determined by exposing 1 or 2 Gm. of the sample, evenly distributed in a weighing bottle of not less than 60 mm. diameter, in a vacuum desiccator at less than 1 mm. pressure, at room temperature, over fresh phosphorus pentoxide until the weight remains constant to the third decimal. It has a light yellow to deep cream color, is microscopically of a honeycomb-like structure, and shows no evidence of fusion. Dried plasma is restored to the original volume by dissolving completely in *Water for Injection*, page 66, and is administered immediately.

Regulations—The outside label must bear the name *Citrated Normal Human Plasma* and indicate the volume of original normal human plasma represented in the container, the manufacturer's lot number of the plasma, the name, address,

and the license number of the manufacturer, and the date beyond which the quality of the contents may not be maintained.

Storage—Preserve liquid plasma at a temperature between 15° and 30° C., and frozen plasma at a temperature of or under minus 15° C. Dried plasma must not be exposed to excessive heat. Citrated Normal Human Plasma must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intravenous, 500 cc.

PLUMBI ACETAS

Lead Acetate

Plumb. Acet.—Sugar of Lead

$\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$

Mol. wt. 379.35

Lead Acetate contains not less than 85.31 per cent and not more than 89.57 per cent of $(\text{CH}_3\text{COO})_2\text{Pb}$, corresponding to not less than 99.5 per cent of the hydrated salt $(\text{CH}_3\text{COO})_2\text{Pb} \cdot 3\text{H}_2\text{O}$.

Description—Lead Acetate occurs as colorless, shining, transparent prisms or plates, as heavy, white, crystalline masses, or as granular crystals. It has a faintly acetous odor, is efflorescent, and absorbs carbon dioxide on exposure to air, becoming incompletely soluble in water.

Solubility—One Gm. of Lead Acetate dissolves in 1.6 cc. of water and in about 30 cc. of alcohol, at 25° C. One Gm. of it dissolves in 0.5 cc. of boiling water. It is freely soluble in glycerin.

Identification—An aqueous solution of Lead Acetate (1 in 10) responds to the tests for lead, page 590, and for acetate, page 587.

Reaction—An aqueous solution of Lead Acetate (1 in 10) is slightly alkaline to litmus paper.

Carbonate—A solution of Lead Acetate (1 in 10) prepared with recently boiled, distilled water is clear, or not more than slightly turbid.

Alkali or earths—Dissolve 2 Gm. of Lead Acetate in a mixture of 100 cc. of distilled water and 1 cc. of glacial acetic acid, and pass hydrogen sulfide through the solution until all of the lead is precipitated. Filter, add 5 drops of sulfuric acid to 50 cc. of the filtrate, evaporate to dryness, and ignite to constant weight. The weight of the residue does not exceed 5 mg.

Iron or copper—An aqueous solution of Lead Acetate (1 in 10) yields with potassium ferrocyanide T.S. a precipitate which is neither blue nor red.

Assay—Weigh accurately about 1.5 Gm. of Lead Acetate, and dissolve it in 5 cc. of glacial acetic acid and sufficient distilled water to make exactly 100 cc. of solution. Transfer exactly 25 cc. of this solution to a 200-cc. volumetric flask, dilute with 50 cc. of distilled water, heat to boiling, and add exactly 50 cc. of tenth-normal potassium dichromate. Heat on a steam bath, with frequent shaking, for 10 minutes, then cool, dilute with distilled water to 200 cc., mix well, and allow the precipitate to settle. Filter the mixture through a filter that has not been previously moistened, rejecting the first 20 cc. of the filtrate, and transfer exactly 100 cc. of the subsequent filtrate to a glass-stoppered flask. Then add 10 cc. of diluted sulfuric acid and 1 Gm. of potassium iodide, mix thoroughly, allow to stand for 10 minutes, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding 2 cc. of starch T.S. near the end of the titration. Each cc. of tenth-normal potassium dichromate is equivalent to 0.01084 Gm. of $(\text{CH}_3\text{COO})_2\text{Pb}$.

Storage—Preserve Lead Acetate in tight containers.

POTASSA SULFURATA

Sulfurated Potash

Pot. Sulfurat.

Sulfurated Potash is a mixture composed chiefly of potassium polysulfides and potassium thiosulfate. It contains not less than 12.8 per cent of sulfur in combination as sulfide.

Description—Sulfurated Potash occurs in irregular pieces, liver-brown, when freshly made, changing to a greenish yellow. It has an odor of hydrogen sulfide and a bitter, acid, and alkaline taste. It decomposes upon exposure to air.

Solubility—One Gm. of Sulfurated Potash is soluble in about 2 cc. of water, usually leaving a slight residue. Alcohol dissolves only the sulfides.

Identification—

A: An aqueous solution of Sulfurated Potash (1 in 10) is light brown in color and is strongly alkaline to litmus paper.

B: To a portion of the solution from *test A*, add an excess of acetic acid: hydrogen sulfide is evolved and sulfur is precipitated.

C: Filter the mixture from *test B* and add to the filtrate an excess of sodium bitartrate T.S.: an abundant, white, crystalline precipitate is formed within 15 minutes.

Minimum of sulfides—Dissolve about 1 Gm. of Sulfurated Potash, accurately weighed, in 10 cc. of distilled water contained in a stoppered flask. Dissolve an equal weight of crystallized cupric sulfate, accurately weighed, in 15 cc. of distilled water. Add the cupric sulfate solution to the Sulfurated Potash solution, stopper the flask, shake for a few minutes, and filter. Acidulate the filtrate with acetic acid, refilter if necessary, and add an equal volume of hydrogen sulfide T.S.: no black precipitate is produced.

Storage—Preserve Sulfurated Potash in tight containers which hold not more than 120 Gm. of the product.

POTASSII ACETAS

Potassium Acetate

Pot. Acet.



Mol. wt. 98.14

Potassium Acetate, when dried to constant weight at 150° C., contains not less than 99 per cent of CH_3COOK .

Description—Potassium Acetate occurs as colorless, monoclinic crystals or as a white, crystalline powder. It has a saline and slightly alkaline taste. Potassium Acetate deliquesces on exposure to moist air.

Solubility—One Gm. of Potassium Acetate dissolves in 0.5 cc. of water and in 3 cc. of alcohol, at 25° C. One Gm. of it dissolves in about 0.2 cc. of boiling water.

Identification—An aqueous solution of Potassium Acetate (1 in 10) responds to the tests for potassium, page 592, and for acetate, page 587.

Reaction—An aqueous solution of Potassium Acetate (1 in 20) is alkaline to litmus paper, but does not affect phenolphthalein T.S.

Arsenic—An aqueous solution of Potassium Acetate meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 1 Gm. of Potassium Acetate in 10 cc. of distilled water, add 3.5 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Potassium Acetate is 20 parts per million.

Assay—Dry Potassium Acetate to constant weight at 150° C., and proceed as directed under the assay for *Alkali Salts of Organic Acids*, page 553. Each cc. of half-normal sulfuric acid is equivalent to 0.04907 Gm. of CH_3COOK .

Storage—Preserve Potassium Acetate in tight containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII BICARBONAS

Potassium Bicarbonate

Pot. Bicarb.

KHCO_3

Mol. wt. 100.11

Potassium Bicarbonate, when dried for 18 hours over sulfuric acid, contains not less than 99 per cent of KHCO_3 .

Description—Potassium Bicarbonate occurs as colorless, transparent, monoclinic prisms or as a white, granular powder. It is odorless, and has a saline and slightly alkaline taste. It is stable in air.

Solubility—One Gm. of Potassium Bicarbonate dissolves in 2.8 cc. of water at 25° C. It is almost insoluble in alcohol.

Identification—An aqueous solution of Potassium Bicarbonate (1 in 10) responds to the tests for potassium, page 592, and for bicarbonate, page 588.

Reaction—An aqueous solution of Potassium Bicarbonate (1 in 10) is slightly alkaline to litmus paper, and is neutral or very slightly alkaline to phenolphthalein T.S.

Carbonate—Add 2 cc. of tenth-normal hydrochloric acid and 2 drops of phenolphthalein T.S. to 1 Gm. of Potassium Bicarbonate, previously dissolved without agitation in 20 cc. of distilled water at a temperature not above 15° C.: the mixture does not at once assume a red tint.

Heavy metals—To 2 Gm. of Potassium Bicarbonate add 5 cc. of distilled water and 8 cc. of diluted hydrochloric acid, heat to boiling, and maintain that temperature for 1 minute. Add 1 drop of phenolphthalein T.S. and sufficient ammonia T.S. dropwise to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid, and dilute with distilled water to 25 cc.: the heavy metals limit, page 586, for Potassium Bicarbonate is 10 parts per million.

Assay—Dry about 4 Gm. of Potassium Bicarbonate for 18 hours over sulfuric acid, weigh accurately, dissolve it in 25 cc. of distilled water, and titrate with normal sulfuric acid, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.1001 Gm. of KHCO_3 .

Storage—Preserve Potassium Bicarbonate in well-closed containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII BITARTRAS

Potassium Bitartrate

Pot. Bitart.—Cream of Tartar, Acid Potassium Tartrate

$\text{KHC}_4\text{H}_4\text{O}_6$

Mol. wt. 188.18

Potassium Bitartrate, when dried to constant weight at 100° C., contains not less than 99.5 per cent of $\text{KOOCCHOH.CHOH.COOH}$.

Description—Potassium Bitartrate occurs as colorless or slightly opaque crystals, or as a white, crystalline powder, having a pleasant, acid taste.

Solubility—One Gm. of Potassium Bitartrate dissolves in 165 cc. of water and in 8820 cc. of alcohol, at 25° C. One Gm. of it dissolves in 16 cc. of boiling water.

Identification—

A: When Potassium Bitartrate is sufficiently heated, it chars and emits inflammable vapors, having an odor resembling that of burning sugar. At a higher temperature and with free access of air, the carbon of the black residue is consumed, and there remains a white, fused mass of potassium carbonate, which imparts a violet color to a non-luminous flame in which it is held.

B: A saturated aqueous solution of Potassium Bitartrate yields a yellow precipitate with sodium cobaltic nitrite T.S.

C: Neutralize a saturated aqueous solution of Potassium Bitartrate with sodium hydroxide T.S. in a test tube, add silver nitrate T.S., then just sufficient ammonia T.S. to dissolve the white precipitate, and boil the solution: silver is deposited on the inner surface of the test tube, forming a mirror.

Reaction—A saturated aqueous solution of Potassium Bitartrate is acid to litmus paper.

Insoluble matter—Agitate 0.5 Gm. of Potassium Bitartrate with 3 cc. of ammonia T.S.: no undissolved residue remains.

Ammonia—The odor of ammonia is not evolved on heating 0.5 Gm. of Potassium Bitartrate with 5 cc. of sodium hydroxide T.S.

Heavy metals—Mix 2 Gm. of Potassium Bitartrate with 15 cc. of distilled water, and add ammonia T.S. dropwise until solution is complete. Add 1 drop of phenolphthalein T.S., and discharge the pink color by the addition of just sufficient diluted acetic acid, added dropwise. Now add 2 cc. additional diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Potassium Bitartrate is 10 parts per million.

Assay—Dry about 6 Gm. of Potassium Bitartrate to constant weight at 100° C., weigh accurately, dissolve it in 100 cc. of boiling distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.1882 Gm. of $\text{KOOC} \cdot \text{CHOH} \cdot \text{COOH}$. Each Gm. of Potassium Bitartrate consumes not less than 5.28 cc. and not more than 5.35 cc. of normal sodium hydroxide.

Storage—Preserve Potassium Bitartrate in well-closed containers.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

POTASSII BROMIDUM

Potassium Bromide

Pot. Bromid.

KBr

Mol. wt. 119.01

Potassium Bromide, when dried to constant weight at 110° C., contains not less than 99 per cent of KBr.

Description—Potassium Bromide occurs as white, odorless, cubical crystals or as a granular powder. It is stable in air.

Solubility—One Gm. of Potassium Bromide dissolves in 1.5 cc. of water, in 250 cc. of alcohol, and in 5 cc. of glycerin, at 25° C.

Identification—An aqueous solution of Potassium Bromide (1 in 5) responds to the tests for potassium, page 592, and for bromides, page 588.

Loss on drying—When dried to constant weight at 110° C., Potassium Bromide loses not more than 1 per cent of its weight.

Alkalinity—Dissolve 1 Gm. of Potassium Bromide in 10 cc. of distilled water, and add 0.1 cc. of tenth-normal sulfuric acid and 1 drop of phenolphthalein T.S. and heat to boiling: the solution remains colorless.

Bromate—Drop 1 cc. of diluted sulfuric acid upon about 1 Gm. of the powdered salt: no yellow color appears at once.

Iodide—Add a few drops of ferric chloride T.S. to 10 cc. of an aqueous solution of Potassium Bromide (1 in 20), shake the mixture, and add 1 cc. of chloroform: the latter does not acquire a violet tint.

Sulfate—A solution of 2 Gm. of Potassium Bromide in 50 cc. of distilled water shows no more sulfate than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—An aqueous solution of Potassium Bromide meets the requirements of the test for arsenic, page 554, omitting the treatment with sulfuric and sulfurous acids.

Barium—A 10-cc. portion of an aqueous solution of Potassium Bromide (1 in 20), when acidulated with hydrochloric acid, is not immediately rendered turbid by the addition of 1 cc. of potassium sulfate T.S.

Heavy metals—Dissolve 2 Gm. of Potassium Bromide in 10 cc. of distilled water, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Potassium Bromide is 10 parts per million.

Assay—Weigh accurately about 0.4 Gm. of Potassium Bromide, previously dried to constant weight at 110° C., and dissolve in 50 cc. of distilled water. Add 50 cc. of tenth-normal silver nitrate, 2 cc. of ferric ammonium sulfate T.S., and 2 cc. of nitric acid. Titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01190 Gm. of KBr. Each Gm. of Potassium Bromide, previously dried, is equivalent to not less than 83.2 cc. and not more than 84.5 cc. of tenth-normal silver nitrate.

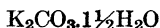
Storage—Preserve Potassium Bromide in well-closed containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII CARBONAS

Potassium Carbonate

Pot. Carb.



Mol. wt. 165.23

Potassium Carbonate, when dried to constant weight at 180° C., contains not less than 99 per cent of K_2CO_3 .

Description—Potassium Carbonate is a white, granular powder. It is odorless, has a strongly alkaline taste, and is very deliquescent.

Solubility—One Gm. of Potassium Carbonate dissolves in 1 cc. of water at 25° C., and in about 0.7 cc. of boiling water. It is insoluble in alcohol.

Identification—An aqueous solution of Potassium Carbonate (1 in 10) responds to the tests for potassium, page 592, and for carbonate, page 588.

Loss on drying—Dry about 3 Gm. of Potassium Carbonate, accurately weighed, to constant weight at 180° C.: its loss in weight is not less than 10 per cent and not more than 16.5 per cent.

Insoluble substances—No residue is left on dissolving 1 Gm. of Potassium Carbonate in 20 cc. of distilled water.

Reaction—An aqueous solution of Potassium Carbonate (1 in 20) is strongly alkaline to litmus paper and to phenolphthalein T.S.

Arsenic—An aqueous solution of Potassium Carbonate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—To 1 Gm. of Potassium Carbonate add 2 cc. of distilled water and 6 cc. of diluted hydrochloric acid. Heat to boiling and maintain that temperature for 1 minute. Add 1 drop of phenolphthalein T.S. and sufficient ammonia T.S. dropwise to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid, and dilute to 25 cc.: the heavy metals limit, page 586, for Potassium Carbonate is 20 parts per million.

Assay—Weigh accurately, in a stoppered weighing-bottle, about 2.5 Gm. of the dried Potassium Carbonate obtained in the test for *loss on drying*, dissolve it in 25 cc. of distilled water, and titrate with normal sulfuric acid, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.06910 Gm. of K_2CO_3 .

Storage—Preserve Potassium Carbonate in tight containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII CHLORIDUM

Potassium Chloride

Pot. Chlorid.

KCl

Mol. wt. 74.55

Potassium Chloride, when dried for 4 hours at $110^{\circ}C.$, contains not less than 99 per cent of KCl.

Description—Potassium Chloride occurs as colorless, elongated, prismatic, or cubical crystals, or as a white, granular powder. It is odorless, has a saline taste, and is permanent in air.

Solubility—One Gm. of Potassium Chloride dissolves in 2.8 cc. of water at $25^{\circ}C.$, and in about 2 cc. of boiling water. It is insoluble in alcohol.

Identification—An aqueous solution of Potassium Chloride (1 in 20) responds to the tests for potassium (page 592) and for chloride (page 589).

Loss on drying—When dried at $110^{\circ}C.$ for 4 hours, Potassium Chloride loses not more than 1 per cent of its weight.

Reaction—An aqueous solution of Potassium Chloride (1 in 10) is neutral to litmus paper.

Iodide or bromide—Dissolve 2 Gm. of Potassium Chloride in 6 cc. of distilled water, add 1 cc. of chloroform, and then add, drop by drop, with constant agitation, 5 cc. of half-strength chlorine T.S.: the chloroform does not acquire a transient violet or permanent orange color.

Arsenic—An aqueous solution of Potassium Chloride meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfuric and sulfurous acids.

Calcium and magnesium—To 20 cc. of an aqueous solution of Potassium Chloride (1 in 100) add 2 cc. of ammonia T.S., and divide the mixture into two portions. Treat one portion with ammonium oxalate T.S. and the other with sodium phosphate T.S.: neither mixture becomes turbid within 5 minutes.

Heavy metals—Dissolve 2 Gm. of Potassium Chloride in 20 cc. of distilled water, add 2 cc. of diluted acetic acid and dilute with distilled water to make 25 cc.: the heavy metals limit, page 586, for Potassium Chloride is 10 parts per million.

Sodium—An aqueous solution of Potassium Chloride (1 in 20) tested on a platinum wire, does not impart a pronounced yellow color to a non-luminous flame.

Assay—Dry about 0.25 Gm. of Potassium Chloride for 4 hours at 110° C., weigh accurately, and dissolve it in 50 cc. of distilled water in a 200-cc. volumetric flask. Add 50 cc. of tenth-normal silver nitrate to the solution, then 5 cc. of nitric acid, and sufficient distilled water to make the mixture measure 200 cc. Mix well, filter through a dry filter into a dry flask, and reject the first 20 cc. of filtrate. To exactly 100 cc. of the subsequent filtrate add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.007455 Gm. of KCl.

Storage—Preserve Potassium Chloride in well-closed containers.

U. S. P. Product of Potassium Chloride—Liquor Chloridorum Trium Isotonicus, *Tabellæ Potassii Chloridi*.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII CITRAS

Potassium Citrate

Pot. Cit.

$K_3C_6H_5O_7 \cdot H_2O$

Mol. wt. 324.40

Potassium Citrate, when rendered anhydrous by drying at 180° C., contains not less than 99 per cent of $C_6H_4.OH.(COOK)_3$.

Description—Potassium Citrate occurs as transparent crystals, or as a white, granular powder. It is odorless, has a cooling, saline taste, and is deliquescent when exposed to moist air.

Solubility—One Gm. of Potassium Citrate dissolves in 1 cc. of water at 25° C. It is almost insoluble in alcohol.

Identification—An aqueous solution of Potassium Citrate (1 in 10) responds to the tests for potassium, page 592, and for citrate, page 589.

Loss on drying—Weigh accurately about 2.5 Gm. of Potassium Citrate, and dry it to constant weight at 180° C. Its loss in weight is not less than 3 per cent and not more than 6 per cent.

Reaction—An aqueous solution of Potassium Citrate (1 in 20) is alkaline to litmus paper, but the color of a 10-cc. portion of the solution is not affected by the addition of 1 drop of phenolphthalein T.S.

Tartrate—A solution of 1 Gm. of Potassium Citrate in 1.5 cc. of distilled water does not deposit a crystalline precipitate on the addition of 1 cc. of acetic acid after scratching the walls of the test tube with a glass rod.

Arsenic—An aqueous solution of Potassium Citrate meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 2 Gm. of Potassium Citrate in 10 cc. of distilled water, add 6 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water, the heavy metals limit, page 586, for Potassium Citrate is 10 parts per million.

Assay—Weigh accurately about 2 Gm. of the dried Potassium Citrate obtained in the determination of *loss on drying*, and proceed as directed under *Alkali Salts of Organic Acids*, page 553. Each cc. of half-normal sulfuric acid is equivalent to 0.05107 Gm. of $C_6H_4.OH.(COOK)_3$.

Storage—Preserve Potassium Citrate in tight containers.

U. S. P. Product of Potassium Citrate—Potassii Citras Effervescens.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII CITRAS EFFERVESCENS**Effervescent Potassium Citrate**

Pot. Cit. Eff.

POTASSIUM CITRATE.....	200 Gm.
SODIUM BICARBONATE, in dry powder.....	477 Gm.
TARTARIC ACID, in dry powder.....	252 Gm.
CITRIC ACID, uneffloresced.....	162 Gm.
To make about.....	1000 Gm.

Dry the potassium citrate on a water bath until it ceases to lose weight, and powder the dried salt. Mix this intimately with the powdered citric and tartaric acids, and thoroughly incorporate the sodium bicarbonate. Place the mixed powders on a plate of glass or in a suitable dish in an oven, previously heated to between 93° and 104° C. Manipulate the mixture carefully with a spatula which is acid-resistant, until it becomes moist, rub it through a No. 6 tinned-iron sieve, and dry the granules at a temperature not exceeding 54° C. Immediately transfer the salt to suitable containers and seal them tightly. Care must be taken to prevent the product from coming in contact with air containing moisture.

NOTE—The proportions of tartaric acid and citric acid may be varied, if desired, but their combined acidity must be equivalent to the acidity indicated in the official formula and the percentage of potassium citrate must be maintained.

Storage—Preserve Effervescent Potassium Citrate in tight containers.

AVERAGE DOSE—Metric, 4 Gm.—Apothecaries, 60 grains.

POTASSII ET SODII TARTRAS**Potassium and Sodium Tartrate**

Pot. et Sod. Tart.—Rochelle Salt

 $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$

Mol. wt. 282.23

Potassium and Sodium Tartrate when rendered anhydrous by drying at 150° C., contains not less than 99 per cent of $\text{KOOC} \cdot \text{CHOH} \cdot \text{CHOH} \cdot \text{COONa}$.

Description—Potassium and Sodium Tartrate occurs as colorless crystals, or as a white, crystalline powder, having a cooling, saline taste. As it effloresces slightly in warm, dry air, the crystals are often coated with a white powder.

Solubility—One Gm. of Potassium and Sodium Tartrate dissolves in 1 cc. of water at 25° C. It is practically insoluble in alcohol.

Identification—

- A:** When ignited, Potassium and Sodium Tartrate emits the odor of burning sugar, leaves a residue which is alkaline to litmus paper, and effervesces with acids.
- B:** To 10 cc. of an aqueous solution of Potassium and Sodium Tartrate (1 in 20) add 10 cc. of acetic acid: a white, crystalline precipitate is produced within 15 minutes.
- C:** An aqueous solution of Potassium and Sodium Tartrate (1 in 10) responds to the tests for tartrate, page 592.
- Loss on drying—**Weigh accurately about 3 Gm. of Potassium and Sodium Tartrate, and dry gradually at first and then to constant weight at 150° C.: the loss in weight is not less than 21 per cent and not more than 26 per cent.
- Reaction—**An aqueous solution of Potassium and Sodium Tartrate (1 in 20) is alkaline to litmus paper, but the color of a 10-cc. portion of this solution is not affected by the addition of 1 drop of phenolphthalein T.S.
- Ammonia—**Heat a 5-cc. portion of an aqueous solution of Potassium and Sodium Tartrate (1 in 10) with sodium hydroxide T.S.: the odor of ammonia is not noticeable.
- Heavy metals—**Dissolve 2 Gm. of Potassium and Sodium Tartrate in a mixture of 20 cc. of distilled water and 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Potassium and Sodium Tartrate is 10 parts per million.
- Assay—**Weigh accurately about 2 Gm. of the dried Potassium and Sodium Tartrate obtained in the determination of *loss on drying*, and proceed as directed under *Alkali Salts of Organic Acids*, page 553. Each cc. of half-normal sulfuric acid is equivalent to 0.05254 Gm. of $\text{KOOC.CHOH.CHOH.COONa}$.
- Storage—**Preserve Potassium and Sodium Tartrate in tight containers.
- U. S. P. Product of Potassium and Sodium Tartrate—**Pulveres Effervescentes Compositi.

AVERAGE DOSE—Metric, 10 Gm.—Apothecaries, 2½ drachms.

POTASSII HYDROXIDUM

Potassium Hydroxide

Pot. Hydrox.—Caustic Potash

KOH

Mol. wt. 56.10

Potassium Hydroxide contains not less than 85 per cent of total alkali calculated as KOH, of which not more than 3.5 per cent is K_2CO_3 .

Great caution is necessary in handling Potassium Hydroxide, as it rapidly destroys organic tissues.

Description—Potassium Hydroxide occurs in dry, white, or nearly white, fused masses, in small pellets, in flakes, in sticks, and in other forms. It is hard and brittle and shows a crystalline fracture. Exposed to the air, Potassium Hydroxide rapidly absorbs carbon dioxide and moisture, and deliquesces.

Solubility—One Gm. of Potassium Hydroxide dissolves in 1 cc. of water, in about 3 cc. of alcohol, and in about 2.5 cc. of glycerin, at 25° C. It is very soluble in boiling alcohol.

Identification—An aqueous solution of Potassium Hydroxide (1 in 25) responds to the tests for potassium, page 592.

Reaction—An aqueous solution of Potassium Hydroxide, even when greatly diluted, is strongly alkaline to litmus paper.

Heavy metals—Dissolve 1 Gm. of Potassium Hydroxide in 5 cc. of distilled water and 7 cc. of diluted hydrochloric acid. Heat to boiling, add 1 drop of phenolphthalein T.S. and then sufficient ammonia T.S. dropwise to give the solution a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Potassium Hydroxide is 30 parts per million.

Insoluble substances—Dissolve 1 Gm. of Potassium Hydroxide in 20 cc. of distilled water: the solution is complete, clear, and colorless.

Assay—Dissolve about 1.5 Gm. of Potassium Hydroxide, accurately weighed, in 40 cc. of recently boiled and cooled distilled water. Cool the solution to 15° C., and titrate with normal sulfuric acid, using phenolphthalein T.S. as the indicator. At the discharge of the pink color of the indicator, record the volume of acid solution required, then add 3 drops of methyl orange T.S., and continue the titration to the production of a persistent pink color. Each cc. of normal sulfuric acid is equivalent to 0.05610 Gm. of KOH. Each cc. difference between the number of cc. of normal sulfuric acid consumed in the methyl orange titration and the phenolphthalein titration is equivalent to 0.1382 Gm. of K₂CO₃.

Storage—Preserve Potassium Hydroxide in tight containers.

POTASSII IODIDUM

Potassium Iodide

Pot. Iodid.

KI

Mol. wt. 166.02

Potassium Iodide, when dried to constant weight at 110° C., contains not less than 99 per cent of KI.

Description—Potassium Iodide occurs as cubical crystals, either transparent and colorless or somewhat opaque and white, or as a white, granular powder. It is stable in dry air, but slightly deliquescent in moist air.

Solubility—One Gm. of Potassium Iodide dissolves in 0.7 cc. of water, in 22 cc. of alcohol, and in 2 cc. of glycerin, at 25° C. One Gm. of it is soluble in 0.5 cc. of boiling water.

Identification—An aqueous solution of Potassium Iodide responds to the tests for potassium, page 592, and for iodide, page 590.

Reaction—An aqueous solution of Potassium Iodide (1 in 20) is neutral or slightly alkaline to litmus paper.

Loss on drying—Dry Potassium Iodide to constant weight at 110° C.: the loss in weight does not exceed 1 per cent.

Alkalinity—Dissolve 1 Gm. of Potassium Iodide in 10 cc. of distilled water, and add 0.1 cc. of tenth-normal sulfuric acid: no color is produced by the subsequent addition of a drop of phenolphthalein T.S.

Iodate, nitrite, thiosulfate, and barium—Dissolve 0.5 Gm. of Potassium Iodide in 10 cc. of distilled water, which has been previously boiled and cooled, and add 2 drops of diluted sulfuric acid: no distinct yellow color appears within 30 seconds, and no turbidity develops in 1 minute.

Nitrate, nitrite and ammonia—Add 5 cc. of sodium hydroxide T.S. and about 0.2 Gm. of aluminum wire to a solution of 1 Gm. of Potassium Iodide in 5 cc. of distilled water, contained in a test tube of about 40-cc. capacity. Insert a pledget of purified cotton in the upper portion of the test tube, and place a piece of moistened red litmus paper over the mouth of the tube. Heat the test tube and its contents on a water bath for 15 minutes: no blue coloration of the paper is discernible.

Heavy metals—Dissolve 2 Gm. of Potassium Iodide in 20 cc. of distilled water, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Potassium Iodide is 10 parts per million.

Assay—Dry about 0.5 Gm. of Potassium Iodide to constant weight at 110° C., weigh accurately, dissolve it in about 10 cc. of distilled water, and add 35 cc. of hydrochloric acid and 5 cc. of chloroform. Titrate with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. The last portions of the iodate solution must be added in drops, the mixture being agitated vigorously and continuously. After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, the mixture should be titrated further with the iodate solution. Each cc. of twentieth-molar potassium iodate is equivalent to 0.01660 Gm. of KI.

Storage—Preserve Potassium Iodide in well-closed containers.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

Antiluetic, Metric, 2 Gm.—Apothecaries, 30 grains.

POTASSII NITRAS

Potassium Nitrate

Pot. Nitras—Saltpeter

KNO_3

Mol. wt. 101.10

Potassium Nitrate, when dried for 4 hours at 110° C., contains not less than 99 per cent of KNO_3 .

Description—Potassium Nitrate occurs as colorless, transparent prisms, or as a white, crystalline powder. It is odorless, has a saline taste, and produces a cooling sensation in the mouth. It is slightly hygroscopic in moist air.

Solubility—One Gm. of Potassium Nitrate dissolves in 3 cc. of water, and in about 620 cc. of alcohol, at 25° C. One Gm. dissolves in 0.5 cc. of boiling water.

Identification—An aqueous solution of Potassium Nitrate (1 in 10) responds to the tests for potassium, page 592, and for nitrates, page 591.

Loss on drying—When dried for 4 hours at 110° C., Potassium Nitrate loses not more than 1 per cent of its weight.

Reaction—An aqueous solution of Potassium Nitrate (1 in 10) is neutral to litmus paper.

Chlorate—Sprinkle about 0.1 Gm. of dry Potassium Nitrate upon 1 cc. of sulfuric acid: the mixture does not become yellow.

Chloride—One-half Gm. of Potassium Nitrate shows no more *chloride* than corresponds to 0.4 cc. of fiftieth-normal hydrochloric acid, page 626.

Heavy metals—Dissolve 1 Gm. of Potassium Nitrate in 15 cc. of distilled water, and add 2 cc. of diluted acetic acid and distilled water to make 25 cc.: the heavy metals limit, page 586, for Potassium Nitrate is 20 parts per million.

Assay—Weigh accurately about 0.4 Gm. of Potassium Nitrate previously dried for 4 hours at 110° C., dissolve in 10 cc. of hydrochloric acid in a small porcelain dish, and evaporate the solution to dryness on a water bath. Dissolve the residue in 10 cc. of hydrochloric acid, and again evaporate to dryness on a water bath, continuing the heat until the residue, when redissolved in distilled water, is neutral to litmus paper. Transfer the residue with the aid of 25 cc. of distilled water to a 200-cc. volumetric flask. Add 50 cc. of tenth-normal silver nitrate to the solution, then 5 cc. of nitric acid, and sufficient distilled water to make the mixture measure 200 cc. Mix well, filter through a dry filter into a dry flask, and reject the first 20 cc. of filtrate. To exactly 100 cc. of the subsequent filtrate add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01011 Gm. of KNO_3 .

Storage—Preserve Potassium Nitrate in well-closed containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

POTASSII PERMANGANAS

Potassium Permanganate

Pot. Permang.

KMnO₄

Mol. wt. 158.03

Potassium Permanganate, when dried over sulfuric acid for 18 hours, contains not less than 99 per cent of KMnO₄.

Great caution should be observed in handling Potassium Permanganate, as dangerous explosions are liable to occur if it is brought into contact with organic or other readily oxidizable substances, either in solution or in the dry condition.

Description—Potassium Permanganate occurs as dark purple crystals, almost opaque by transmitted light and of a blue metallic luster by reflected light. The color is sometimes modified by a dark bronze-like appearance. It is stable in air.

Solubility—One Gm. of Potassium Permanganate dissolves in 15 cc. of water at 25° C. One Gm. of it dissolves in 3.5 cc. of boiling water.

Identification—An aqueous solution of Potassium Permanganate is deep violet red when concentrated, and rose color when highly diluted, and responds to the tests for permanganate, page 591.

Loss on drying—When dried over sulfuric acid for 18 hours, Potassium Permanganate loses not more than 0.5 per cent of its weight.

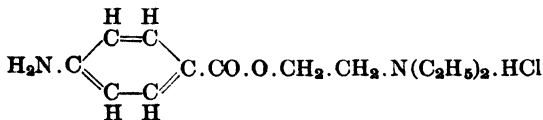
Assay—Dry about 2 Gm. of Potassium Permanganate over sulfuric acid for 18 hours, then weigh accurately 0.1 to 0.12 Gm., and dissolve it in 25 cc. of distilled water. Mix the solution with 2 cc. of sulfuric acid and 50 cc. of tenth-normal oxalic acid, warm the mixture to about 80° C., and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal oxalic acid is equivalent to 0.003161 Gm. of KMnO₄.

Storage—Preserve Potassium Permanganate in well-closed containers.

PROCAINÆ HYDROCHLORIDUM

Procaine Hydrochloride

Procain. Hydrochlor.—Procaine



C₁₃H₂₀N₂O₂·HCl

Mol. wt. 272.77

Description—Procaine Hydrochloride occurs as small, white crystals, or as a white, crystalline powder. It is odorless and is stable in air. Procaine Hydrochloride exhibits local anesthetic properties when placed on the tongue.

Solubility—One Gm. of Procaine Hydrochloride dissolves in 1 cc. of water and in 30 cc. of alcohol, at 25° C. It is slightly soluble in chloroform, and almost insoluble in ether.

Melting point—Procaine Hydrochloride melts between 153° and 156° C., page 595.

Identification—

A: Separate portions of an aqueous solution of Procaine Hydrochloride (1 in 10) yield precipitates with gold chloride T.S., iodine T.S., mercuric potassium iodide T.S., and with trinitrophenol T.S.

- B:** An aqueous solution of Procaine Hydrochloride (1 in 10) remains unchanged upon the addition of an aqueous solution of sodium bicarbonate (1 in 20), but with sodium hydroxide T.S. or sodium carbonate T.S. it yields a colorless, oily precipitate which becomes crystalline on standing.
- C:** Dissolve 0.1 Gm. of Procaine Hydrochloride in 5 cc. of distilled water, add 2 drops each of hydrochloric acid and an aqueous solution of sodium nitrite (1 in 10), and then a solution of 0.2 Gm. of betanaphthol in a mixture of 3 cc. of sodium hydroxide T.S. and 7 cc. of distilled water: a scarlet red precipitate is produced (phenacaine yields a yellow precipitate).
- D:** Procaine Hydrochloride responds to the test for *chloride*, page 589.
- Difference from cocaine**—To a solution of 0.1 Gm. of Procaine Hydrochloride in 5 cc. of distilled water add 3 drops of diluted sulfuric acid, followed by 5 drops of potassium permanganate T.S.: the violet color of the latter is immediately discharged.
- Loss on drying**—When dried over sulfuric acid for 18 hours, Procaine Hydrochloride loses not more than 1 per cent of its weight.
- Ash**—Procaine Hydrochloride yields not more than 0.15 per cent of ash, page 556.
- Reaction**—An aqueous solution of Procaine Hydrochloride (1 in 20) is neutral to litmus paper.
- Carbonizable substances**—Dissolve 0.5 Gm. of Procaine Hydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid G, page 563.
- Heavy metals**—Dissolve 1 Gm. of Procaine Hydrochloride in 15 cc. of distilled water, add 1 cc. of normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Procaine Hydrochloride is 20 parts per million.
- Storage**—Preserve Procaine Hydrochloride in well-closed, light-resistant containers.

PRUNUS VIRGINIANA

Wild Cherry

Prun. Virg.—Wild Black Cherry Bark

Wild Cherry is the stem bark of *Prunus serotina* Ehrhart (Fam. *Rosaceæ*), collected in autumn and carefully dried. Borke, if present, should be removed.

Description—

Unground Wild Cherry—Usually in transversely curved pieces up to 8 cm. in width and from 0.5 to 8 mm. in thickness; outer surface of rossed bark moderate brown to light olive brown, smooth, except for numerous lenticel-scars; outer surface of unrossed bark, weak reddish brown and glossy (young bark) to olive gray (older bark), with light-colored, transversely elongated lenticels or roughened and flaky with light-colored lichens; inner surface weak reddish brown to weak orange, with fine, reticulate striations and numerous minute fissures; fracture short, granular; odor distinct, resembling bitter almond when macerated in water; taste astringent, aromatic, and agreeably bitter.

Histology—A cork of varying thickness (*absent in rossed bark*); a phelloderm of tangentially elongated cells containing chloroplasts; a primary cortex of parenchyma containing starch, tannin and an occasional monoclinic prism of calcium oxalate; a pericycle within which occur a nearly continuous zone of stone cell groups and some fibers; a relatively broad phloem, broken by numerous, curved fissures into scythe-shaped areas, each generally consisting of a curved medullary ray, 1 to 8 cells wide, and a phloem patch, the phloem patches containing starch- and crystal-parenchyma, simple and branched bast-fibers accompanied by crystal-fibers containing monoclinic prisms of calcium oxalate and scattered groups of stone cells.

Powdered Wild Cherry—Light brown to light yellowish brown; fragments of reddish brown to yellowish orange cork, few; stone cells numerous, frequently elongated, with short branches or a wavy and irregular outline and with thick, lamellated, porous, strongly lignified walls; sclerenchyma-fibers few, not greatly elongated, frequently accompanied by crystal-fibers, calcium oxalate chiefly in monoclinic prisms but also in rosette aggregates, from 10 to 75 microns in diameter; starch grains simple and compound, nearly spherical, from 2 to 15 microns in diameter.

Storage—Preserve Wild Cherry in tight, light-resistant containers.

U. S. P. Product of Wild Cherry—Syrupus Pruni Virginianæ.

PULVERES EFFERVESCENTES COMPOSITI

Compound Effervescent Powders

Pulv. Eff. Co.—Seidlitz Powders

The mixture in a blue paper weighs not less than 9.5 Gm. and not more than 10.5 Gm., and contains not less than 23 per cent and not more than 27 per cent of NaHCO_3 , and not less than 73 per cent and not more than 78 per cent of $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$. The white paper contains not less than 2 Gm. and not more than 2.4 Gm. of $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$.

SODIUM BICARBONATE, dry and all passing through a No.

60 standard mesh sieve..... 30 Gm.

POTASSIUM AND SODIUM TARTRATE, dry and all passing

through a No. 40 standard mesh sieve..... 90 Gm.

TARTARIC ACID, dry and all passing through a No. 40

standard mesh sieve..... 26 Gm.

Mix the sodium bicarbonate intimately with the potassium and sodium tartrate, divide the mixture into 12 equal parts, and wrap each part in a blue paper. Divide the tartaric acid into 12 equal parts, and wrap each part in a white paper.

Identification—To 5 cc. of an aqueous solution of the mixture in a blue paper (1 in 20) add 5 cc. of acetic acid, and when effervescence has ceased, shake the solution vigorously: a white, crystalline precipitate, soluble in ammonia T.S., separates.

Assay for sodium bicarbonate—Mix thoroughly the contents of a blue paper, then dissolve 2 Gm. of it in 80 cc. of distilled water, add 20 cc. of half-normal sulfuric acid, boil the solution until its volume is reduced to about 50 cc., and titrate the excess of acid with half-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of half-normal sulfuric acid is equivalent to 0.04201 Gm. of sodium bicarbonate.

Assay for potassium and sodium tartrate—Proceed as directed under *Alkali Salts of Organic Acids*, page 553, using 2 Gm. of the contents of the same blue paper as that from which the material for the preceding assay was taken. The difference between the number of cc. of half-normal sulfuric acid consumed in this assay and the number of cc. consumed in the assay for sodium bicarbonate, multiplied by 0.07056, indicates the number of Gm. of potassium and sodium tartrate contained in the 2 Gm. assayed. The sum of the percentages of sodium bicarbonate and of the potas-

sium and sodium tartrate, determined by the above assays, is not less than 99 per cent.

Assay for tartaric acid—Proceed as directed for the *assay* under *Acidum Tartaricum*, page 32, using the entire contents of one white paper.

Storage—Preserve Compound Effervescent Powders in well-closed containers, in a dry place.

AVERAGE DOSE—The contents of a white and of a blue paper, each dissolved in about 2 fluidounces of water, the solutions mixed, and administered just after the effervescence begins to subside.

PULVIS CRETÆ COMPOSITUS

Compound Chalk Powder

Pulv. Cret. Co.

PREPARED CHALK.....	30 Gm.
ACACIA, in fine powder.....	20 Gm.
SUCROSE, in fine powder.....	50 Gm.
To make.....	100 Gm.

Mix the powders intimately by trituration and pass the product through a No. 60 sieve.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

PYROXYLINUM

Pyroxylin

Pyroxylin.—Soluble Guncotton

Pyroxylin is a product obtained by the action of a mixture of nitric and sulfuric acids on cotton, and consists chiefly of cellulose tetranitrate [$C_{12}H_{16}O_6(NO_3)_4$].

Description—Pyroxylin occurs as a yellowish white, matted mass of filaments, resembling raw cotton in appearance, but harsh to the touch. It is exceedingly inflammable, burning, when unconfined, very rapidly and with a luminous flame. When kept in well-closed bottles and exposed to light, it is decomposed with the evolution of nitrous vapors, leaving a carbonaceous residue.

Solubility—Pyroxylin dissolves slowly but completely in 25 parts of a mixture of 3 volumes of ether and 1 volume of alcohol. It is soluble in acetone and in glacial acetic acid, and is precipitated from these solutions by water.

Ash—Saturate about 0.5 Gm. of Pyroxylin, accurately weighed, with alcohol in a dish placed in cold distilled water, and ignite the Pyroxylin at the top. When combustion is complete, heat the dish to redness, and cool: not more than 0.3 per cent of ash remains.

Water-soluble substances—Stir 1 Gm. of Pyroxylin with 20 cc. of distilled water for 10 minutes, and filter: the filtrate does not have an acid reaction. Evaporate 10 cc. of the filtrate to dryness on a water bath: not more than 1.5 mg. of residue remains.

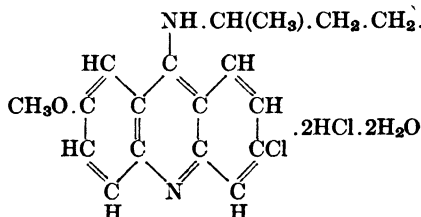
Storage—Preserve Pyroxylin loosely packed in cartons.

U. S. P. Products of Pyroxylin—Collodium, Collodium Flexile.

QUINACRINÆ HYDROCHLORIDUM

Quinacrine Hydrochloride

Quinacrin. Hydrochlor.—Mepacrine Hydrochloride



$\text{C}_{23}\text{H}_{30}\text{ClN}_3\text{O} \cdot 2\text{HCl} \cdot 2\text{H}_2\text{O}$

Mol. wt. 508.91

Quinacrine Hydrochloride contains not less than 77 per cent and not more than 80.2 per cent of quinacrine base, $\text{C}_{23}\text{H}_{30}\text{ClN}_3\text{O}$, corresponding to not less than 98 per cent of $\text{C}_{23}\text{H}_{30}\text{ClN}_3\text{O} \cdot 2\text{HCl} \cdot 2\text{H}_2\text{O}$.

Description—Quinacrine Hydrochloride is a bright yellow, crystalline powder. It is odorless and has a bitter taste.

Solubility—One Gm. of Quinacrine Hydrochloride dissolves in about 35 cc. of water at 25° C. It is soluble in alcohol.

Identification—

- A: To 5 cc. of an aqueous solution of Quinacrine Hydrochloride (1 in 40), add a slight excess of ammonia T.S.: a pasty, yellow to orange precipitate is formed which adheres to the wall of the vessel and is soluble in ether.
- B: To 5 cc. of an aqueous solution of Quinacrine Hydrochloride (1 in 40), add 1 cc. of diluted nitric acid: a yellow, crystalline precipitate is formed.
- C: To 5 cc. of an aqueous solution of Quinacrine Hydrochloride (1 in 40), add 1 cc. of mercuric chloride T.S.: a yellow precipitate is formed.
- D: The filtrate from the precipitate, obtained in *Identification test A*, when acidified with nitric acid, responds to the identity tests for chloride, page 589.

Loss on drying—When dried to constant weight at 105° C., Quinacrine Hydrochloride loses not less than 6 per cent and not more than 8 per cent of its weight.

The determination must be made in a shallow weighing-bottle which is capped with a well-fitting glass cap immediately upon removal from the oven.

Ash—The ash from 0.2 Gm. of Quinacrine Hydrochloride is negligible, page 556.

Hydrogen-ion concentration—An aqueous solution of Quinacrine Hydrochloride (1 in 100) has a pH of about 5.

Assay—Transfer about 0.25 Gm. of Quinacrine Hydrochloride, accurately weighed, to a 100-cc. volumetric flask, and add 10 cc. of distilled water and 10 cc. of a solution prepared by dissolving 26 Gm. of sodium acetate and 26 cc. of acetic acid in enough distilled water to make 100 cc. of solution. Add 50 cc. of tenth-normal potassium dichromate and enough distilled water to make the mixture measure 100 cc. Stopper the flask, mix the contents thoroughly, then filter

through a dry filter paper, rejecting the first 15 cc. of the filtrate. Measure 50 cc. of the subsequent filtrate into a glass-stoppered flask, and add 15 cc. of hydrochloric acid and 20 cc. of potassium iodide T.S. Stopper the flask, mix the contents by swirling gently, and allow the mixture to stand in the dark for 5 minutes. Dilute with 75 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. as indicator when the end-point is neared. Perform a blank test with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal potassium dichromate is equal to 0.006666 Gm. of $C_{23}H_{30}ClN_5O$.

Storage—Preserve Quinacrine Hydrochloride in tight, light-resistant containers.

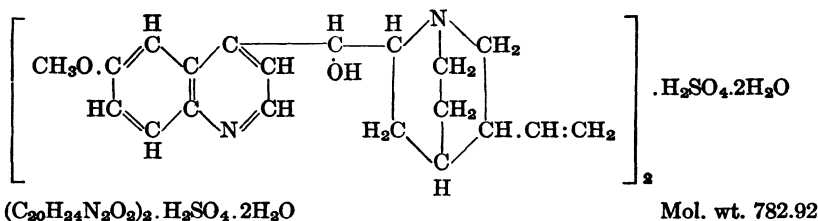
U. S. P. Product of Quinacrine Hydrochloride—Tabellæ Quinacrinæ Hydrochloridi.

AVERAGE DOSE—Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

QUINIDINÆ SULFAS

Quinidine Sulfate

Quinidin. Sulf.



Mol. wt. 782.92

Quinidine Sulfate is the sulfate of an alkaloid obtained from the bark of the stem or of the root of various species of *Cinchona* and their hybrids (Fam. *Rubiaceæ*).

Description—Quinidine Sulfate occurs as fine, needle-like, white crystals, frequently cohering in masses. It is odorless, has a very bitter taste, and darkens on exposure to light.

Solubility—One Gm. of Quinidine Sulfate dissolves in 100 cc. of water, and in about 10 cc. of alcohol, at 25° C. One Gm. of it dissolves in 15 cc. of boiling water. It is soluble in chloroform, but almost insoluble in ether.

Identification—

- A: An aqueous solution of Quinidine Sulfate acidulated with diluted sulfuric acid exhibits a vivid blue fluorescence.
- B: An aqueous solution of Quinidine Sulfate is dextrorotatory (*quinine sulfate* is levorotatory).
- C: Add 1 or 2 drops of bromine T.S. to 5 cc. of an aqueous solution of Quinidine Sulfate (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.
- D: To 5 cc. of an aqueous solution of Quinidine Sulfate (1 in 100) add 1 cc. of silver nitrate T.S., and stir the mixture with a glass rod: a white precipitate appears after a short interval (difference from *many other alkaloids*).
- E: Quinidine Sulfate responds to the test for sulfate, page 592.

Loss on drying—When dried to constant weight at 120° C., Quinidine Sulfate loses not more than 5 per cent of its weight.

Ash—Quinidine Sulfate yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Quinidine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 563.

Reaction—An aqueous solution of Quinidine Sulfate (1 in 100) is neutral or slightly alkaline to litmus paper.

Ammonium or other inorganic salts—One Gm. of Quinidine Sulfate dissolves in 5 cc. of a warm mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol with not more than a slight turbidity.

Other cinchona alkaloids—Dissolve 0.5 Gm. of Quinidine Sulfate in 15 cc. of boiling distilled water, and add a solution of 0.5 Gm. of potassium iodide in 5 cc. of distilled water, which, if necessary, has previously been neutralized to litmus paper with tenth-normal sulfuric acid: a white precipitate appears. Mix well, cool the mixture to 15° C., and keep it at this temperature for 1 hour with frequent agitation. Filter, and add 2 drops of ammonia T.S. to the filtrate: no turbidity is produced within 1 minute.

Storage—Preserve Quinidine Sulfate in well-closed, light-resistant containers.

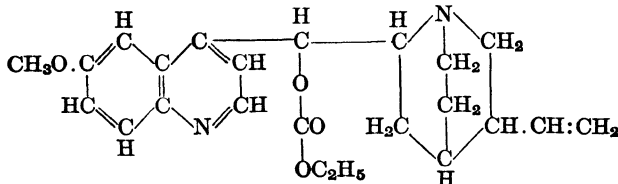
U. S. P. Product of Quinidine Sulfate—Tabellæ Quinidinæ Sulfatis.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

QUININÆ ÆTHYLCARBONAS

Quinine Ethylcarbonate

Quin. Æthylcarb.—Euquinine



$C_{23}H_{28}N_2O_4$

Mol. wt. 396.47

The ethylcarbonate of an alkaloid obtained from cinchona.

Description—Quinine Ethylcarbonate occurs as white, fine, soft needles, usually matted together in fleecy masses. It is odorless and practically tasteless, but when masticated it slowly develops a slightly bitter taste. It darkens on exposure to light.

Solubility—Quinine Ethylcarbonate is only slightly soluble in water. One Gm. dissolves in 3 cc. of alcohol, in about 1 cc. of chloroform, and in 10 cc. of ether, at 25° C. It is readily soluble in dilute acids.

Melting point—Quinine Ethylcarbonate melts between 89° and 91° C., page 595.

Identification—

- A: A solution of Quinine Ethylcarbonate in diluted sulfuric acid exhibits a blue fluorescence.
- B: To 5 cc. of an aqueous solution of Quinine Ethylcarbonate (1 in 1000), made with the aid of a slight excess of diluted sulfuric acid, add 2 or 3 drops of bromine T.S., and follow with 1 cc. of ammonia T.S.: the liquid acquires a green color due to the formation of thalleoquin.
- C: To about 0.2 Gm. of Quinine Ethylcarbonate add 2 cc. of sodium hydroxide T.S. and 5 cc. of iodine T.S., and gently warm the mixture: the odor of iodoform is evolved.

D: Digest about 1 Gm. of Quinine Ethylcarbonate with 10 cc. of a solution of potassium hydroxide in dehydrated alcohol (1 in 20): a white precipitate which effervesces with acids gradually appears in the mixture.

Loss on drying—When dried over sulfuric acid for 18 hours, Quinine Ethylcarbonate loses not more than 2 per cent of its weight.

Ash—Quinine Ethylcarbonate yields not more than 0.2 per cent of ash, page 556.

Reaction—A saturated, aqueous solution of Quinine Ethylcarbonate is slightly alkaline to litmus paper.

Chloride—Dissolve 0.3 Gm. of Quinine Ethylcarbonate in 10 cc. of diluted nitric acid and 20 cc. of distilled water: a 10-cc. portion of this solution is not rendered turbid at once by the addition of a few drops of silver nitrate T.S.

Sulfate—A 10-cc. portion of the solution of Quinine Ethylcarbonate prepared for use in the test for *chloride* does not become turbid at once upon the addition of a few drops of barium chloride T.S.

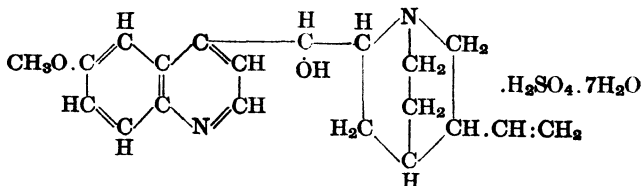
Storage—Preserve Quinine Ethylcarbonate in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

QUININÆ BISULFAS

Quinine Bisulfate

Quin. Bisulf.—Quinine Acid Sulfate



$C_{20}H_{24}N_2O_3 \cdot H_2SO_4 \cdot 7H_2O$

Mol. wt. 548.60

The bisulfate of an alkaloid obtained from cinchona.

Description—Quinine Bisulfate occurs as white or colorless crystals, usually needle-like, or as a white, crystalline powder. It is odorless, and has a very bitter taste. It effloresces on exposure to dry air, and turns yellow on exposure to light.

Solubility—One Gm. of Quinine Bisulfate dissolves in 10 cc. of water, in 25 cc. of alcohol, in about 15 cc. of glycerin, in about 625 cc. of chloroform at 25° C. One Gm. of it dissolves in 1 cc. of boiling water and in 1 cc. of boiling alcohol.

Identification—

A: An aqueous solution of Quinine Bisulfate (1 in 20) has a blue fluorescence.

B: An aqueous solution of Quinine Bisulfate is strongly levorotatory, page 601.

C: Add 2 or 3 drops of bromine T.S. to 5 cc. of an aqueous solution of Quinine Bisulfate (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

D: Quinine Bisulfate responds to the tests for sulfate, page 592.

Loss on drying—When dried to constant weight at 100° C., Quinine Bisulfate loses not more than 24 per cent of its weight.

Ash—Quinine Bisulfate yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Quinine Bisulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 563.

Reaction—An aqueous solution of Quinine Bisulfate (1 in 20) is strongly acid to litmus paper.

Ammonium salts—Heat 0.3 Gm. of Quinine Bisulfate with 3 cc. of sodium hydroxide T.S. on a water bath: the mixture does not at once evolve the odor of ammonia.

Other cinchona alkaloids—Dissolve 2.52 Gm. of Quinine Bisulfate in a mixture of 20 cc. of alcohol and 50 cc. of hot distilled water, and neutralize the solution with normal sodium hydroxide, using 2 drops of methyl red T.S. as the indicator. Evaporate the solution to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of distilled water, and agitate the mixture at 65° C. for 30 minutes. Cool the mixture to 15° C., and allow it to stand at this temperature for 2 hours with occasional shaking, then filter it through a filter paper having a diameter of from 8 to 10 cm. Transfer 5 cc. of this filtrate, at a temperature of 15° C., to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S.; a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3 , have a temperature of 15° C., and be added at once.

Storage—Preserve Quinine Bisulfate in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

QUININÆ DIHYDROCHLORIDUM

Quinine Dihydrochloride

Quin. Dihydrochlor.

$\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2 \cdot 2\text{HCl}$

Mol. wt. 397.34

The dihydrochloride of an alkaloid obtained from cinchona.

Description—Quinine Dihydrochloride occurs as a white, odorless powder, having a very bitter taste. It is affected by light.

Solubility—One Gm. of Quinine Dihydrochloride dissolves in about 0.6 cc. of water and in about 12 cc. of alcohol, at 25° C. It is slightly soluble in chloroform and very slightly soluble in ether.

Identification—

A: Add 2 or 3 drops of bromine T.S. to 5 cc. of an aqueous solution of Quinine Dihydrochloride (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

B: Quinine Dihydrochloride responds to the tests for chloride, page 589.

C: An aqueous solution of Quinine Dihydrochloride is strongly acid to litmus paper.

Loss on drying—When dried at 100° C. to constant weight, Quinine Dihydrochloride loses not more than 3 per cent of its weight.

Ash—Quinine Dihydrochloride yields not more than 0.15 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Quinine Dihydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 563.

Sulfate—One Gm. of Quinine Dihydrochloride shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Barium—Add a few drops of diluted sulfuric acid to 10 cc. of an aqueous solution of Quinine Dihydrochloride (1 in 20): the mixture does not become turbid.

Other cinchona alkaloids—Dissolve 1.8 Gm. of Quinine Dihydrochloride in 10 cc. of distilled water, add a slight excess of ammonia T.S., extract the mixture successively with 20, 10, and 10 cc. of chloroform, and evaporate the combined chloroform solutions to dryness on a water bath. Dissolve the residue in 25 cc. of alcohol, dilute the solution with 50 cc. of hot distilled water, add normal sulfuric acid (about 5 cc.) to render the solution acid, using 2 drops of methyl red T.S. as the indicator, and neutralize the excess of acid with normal sodium hydroxide. Evaporate the liquid to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of distilled water, and agitate the mixture at 65° C.

for 30 minutes. Cool the mixture to 15° C., and allow it to stand at this temperature for 2 hours, with occasional shaking, then filter it through a filter paper having a diameter of from 8 to 10 cm. Transfer 5 cc. of this filtrate, at a temperature of 15° C., to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S.: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3 , have a temperature of 15° C., and be added at once.

Storage—Preserve Quinine Dihydrochloride in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

QUININÆ ET UREÆ HYDROCHLORIDUM

Quinine and Urea Hydrochloride

Quin. et Urea. Hydrochlor.

$\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2 \cdot \text{HCl} \cdot \text{CO}(\text{NH}_2)_2 \cdot \text{HCl} \cdot 5\text{H}_2\text{O}$

Mol. wt. 547.48

Quinine and Urea Hydrochloride is a double salt of quinine and urea hydrochlorides. It contains not less than 58 per cent and not more than 65 per cent of anhydrous quinine ($\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2$).

Description—Quinine and Urea Hydrochloride occurs as colorless, translucent prisms, white granules, or as a white powder. It is odorless, has a very bitter taste, and is affected by light.

Solubility—One Gm. of Quinine and Urea Hydrochloride dissolves in 1 cc. of water and in 3 cc. of alcohol, at 25° C.

Identification—

A: A solution of Quinine and Urea Hydrochloride in diluted sulfuric acid (1 in 1000) shows a blue fluorescence.

B: Add 2 or 3 drops of bromine T.S. to 5 cc. of an aqueous solution of Quinine and Urea Hydrochloride (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

C: Add 2 cc. of colorless nitric acid to a cold solution of about 1 Gm. of Quinine and Urea Hydrochloride in 2 cc. of distilled water, and cool the mixture at once to the temperature of melting ice: crystalline leaflets of urea nitrate are formed on standing. Collect the crystals in a funnel upon glass wool, wash them with about 5 cc. of a cold mixture of equal volumes of nitric acid and distilled water, and after draining dissolve the crystals in a few cc. of distilled water: the addition of a few drops of mercuric nitrate T.S. to the urea nitrate solution, followed by sodium hydroxide T.S. until the solution is nearly neutralized, produces a white precipitate.

D: Quinine and Urea Hydrochloride responds to the tests for chloride, page 589.

Ash—Quinine and Urea Hydrochloride yields not more than 0.15 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Quinine and Urea Hydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 563.

Reaction—An aqueous solution of Quinine and Urea Hydrochloride (1 in 20) is strongly acid to litmus paper.

Ammonium compounds—Warm 10 cc. of an aqueous solution of Quinine and Urea Hydrochloride (1 in 20) with 5 cc. of sodium hydroxide T.S. to 50° C.: the mixture does not at once evolve the odor of ammonia.

Other cinchona alkaloids—Dissolve about 3 Gm. of Quinine and Urea Hydrochloride in 30 cc. of distilled water in a separator, add 10 cc. of ammonia T.S., extract

the mixture successively with 30 and 20 cc. of chloroform, and evaporate the combined chloroform solutions to dryness on a water bath. Dissolve 1.5 Gm. of the residue in 25 cc. of alcohol, dilute the solution with 50 cc. of hot distilled water, add normal sulfuric acid (about 5 cc.) until the solution is acid, using 2 drops of methyl red T.S. as the indicator, and neutralize the excess of acid with normal sodium hydroxide. Evaporate the liquid to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of distilled water, and agitate the mixture at 65° C. for 30 minutes. Cool the mixture to 15° C., and allow it to stand at this temperature for 2 hours with occasional shaking, then filter it through a filter paper having a diameter of from 8 to 10 cm. Transfer 5 cc. of this filtrate, at a temperature of 15° C., to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S.: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3 , have a temperature of 15° C., and be added at once.

Assay—Dissolve about 0.5 Gm. of Quinine and Urea Hydrochloride, accurately weighed, in 5 cc. of distilled water in a separator, add 3 cc. of ammonia T.S., and shake the mixture with successive portions of 10, 5, and 5 cc., respectively, of chloroform or sufficient to extract the quinine completely. Evaporate the combined chloroform solutions on a water bath, dissolve the residue in 10 cc. of ether, evaporate the solution to dryness in a tared dish, and dry the residue, consisting of anhydrous quinine, to constant weight at 100° C.

Storage—Preserve Quinine and Urea Hydrochloride in tight, light-resistant containers.

QUININÆ HYDROCHLORIDUM

Quinine Hydrochloride

Quin. Hydrochlor.

$\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2 \cdot \text{HCl} \cdot 2\text{H}_2\text{O}$

Mol. wt. 396.91

The hydrochloride of an alkaloid obtained from cinchona.

Description—Quinine Hydrochloride occurs as white, silky, glistening needles. It is odorless, has a very bitter taste, and effloresces when exposed to warm air.

Solubility—One Gm. of Quinine Hydrochloride dissolves in 16 cc. of water, in 1 cc. of alcohol, in about 7 cc. of glycerin, in about 1 cc. of chloroform, and in about 350 cc. of ether, at 25° C. One Gm. dissolves in about 0.5 cc. of boiling water.

Identification—

A: Solutions of Quinine Hydrochloride are not fluorescent, except when highly diluted, or upon the addition of diluted sulfuric acid.

B: Add 2 or 3 drops of bromine T.S. to 5 cc. of an aqueous solution of Quinine Hydrochloride (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color, due to the formation of thalleioquin.

C: Quinine Hydrochloride responds to the tests for chloride, page 589.

Loss on drying—When dried at 120° C. for 2 hours, Quinine Hydrochloride loses not more than 10 per cent of its weight.

Ash—Quinine Hydrochloride yields not more than 0.15 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.1 Gm. of Quinine Hydrochloride in 2 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 563.

Reaction—An aqueous solution of Quinine Hydrochloride (1 in 25) is neutral or not more than slightly alkaline to litmus paper.

Sulfate—One Gm. of Quinine Hydrochloride shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Inorganic salts—One Gm. of Quinine Hydrochloride dissolves completely in 7 cc. of a mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol.

Barium—Add 5 drops of diluted sulfuric acid to 10 cc. of an aqueous solution of Quinine Hydrochloride (1 in 20): no turbidity is produced.

Other cinchona alkaloids—Dissolve about 2.5 Gm. of Quinine Hydrochloride in 60 cc. of distilled water in a separator, add 10 cc. of ammonia T.S., extract the mixture

successively with 30 cc. and 20 cc. of chloroform, and evaporate the combined chloroform solutions to dryness on a water bath. Dissolve 1.5 Gm. of this residue in 25 cc. of alcohol, dilute the solution with 50 cc. of hot distilled water, add normal sulfuric acid (about 5 cc.) until the solution is acid, using 2 drops of methyl red T.S. as the indicator, and neutralize the excess of acid with normal sodium hydroxide. Evaporate the solution to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of distilled water, and maintain the mixture at 65° C. for 30 minutes with frequent agitation. Cool the mixture to 15° C., allow it to stand at this temperature for 2 hours with occasional shaking, and then filter it through a filter paper of a diameter from 8 to 10 cm. Transfer 5 cc. of the filtrate to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S.; a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3 , have a temperature of 15° C., and be added at once.

Storage—Preserve Quinine Hydrochloride in tight, light-resistant containers.

U. S. P. Product of Quinine Hydrochloride—*Injectio Quininae Hydrochloridi et Æthylis Carbamatis*.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

QUININÆ SULFAS

Quinine Sulfate

Quin. Sulf.

$(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2)_2 \cdot \text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$

Mol. wt. 782.92

The sulfate of an alkaloid obtained from cinchona.

Description—Quinine Sulfate occurs as white, fine, needle-like crystals, usually lusterless, making a light and readily compressible mass. It is odorless, and has a persistent, very bitter taste. When exposed to light, Quinine Sulfate acquires a brown tint.

Solubility—One Gm. of Quinine Sulfate dissolves in 810 cc. of water, and in 120 cc. of alcohol, at 25° C. One Gm. of it dissolves in 35 cc. of water at 100° C., and in about 10 cc. of alcohol at 80° C. It is slightly soluble in chloroform and in ether, but is freely soluble in a mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol.

Identification—

- A: Acidify a saturated, aqueous solution of Quinine Sulfate with diluted sulfuric acid: the solution develops a vivid blue fluorescence.
- B: Add 1 or 2 drops of bromine T.S. to 5 cc. of an aqueous solution of Quinine Sulfate (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.
- C: An aqueous solution of Quinine Sulfate (1 in 50) made with a few drops of hydrochloric acid, responds to the tests for sulfate, page 592.
- D: A solution of Quinine Sulfate (1 in 50) in normal sulfuric acid is levorotatory, page 601.

Loss on drying—When dried to constant weight at 100° C., Quinine Sulfate loses not more than 5 per cent of its weight.

Ash—Quinine Sulfate yields not more than 0.05 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Quinine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 563.

Reaction—A saturated, aqueous solution of Quinine Sulfate is neutral or not more than slightly alkaline to litmus paper.

Inorganic salts—Heat 1 Gm. of Quinine Sulfate to 50° C. with 7 cc. of a mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol: it dissolves completely and the solution remains clear on cooling.

Other cinchona alkaloids—Dry Quinine Sulfate (which must be neutral or slightly alkaline to litmus paper) at 50° C. for 2 hours, and then agitate 1.8 Gm. of the dried salt with 20 cc. of distilled water at 65° C. for 30 minutes. Cool the mixture to 15° C., allow it to stand at this temperature for 2 hours with occasional shaking, and then filter it through a filter paper of a diameter of from 8 to 10 cm. Transfer 5 cc. of the filtrate, at a temperature of 15° C., to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S.: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3 , have a temperature of 15° C., and be added at once.

Storage—Preserve Quinine Sulfate in well-closed, light-resistant containers.

U. S. P. Product of Quinine Sulfate—Tabellæ Quininæ Sulfatis.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

RESINA

Rosin

Colophony

Rosin is a solid resin obtained from *Pinus palustris* Miller, and from other species of *Pinus* (Fam. *Pinaceæ*).

Description—Rosin occurs as sharply angular, translucent, amber-colored fragments, frequently covered with a yellow dust; fracture brittle at ordinary temperatures, shiny and shallow-conchoidal. The odor and taste are slightly terebinthinate. Rosin is easily fusible and burns with a dense, yellowish smoke.

Solubility—Rosin is freely soluble in alcohol, in ether, in benzene, in glacial acetic acid, and in fixed or volatile oils. It is also soluble in dilute solutions of the fixed alkali hydroxides.

Specific gravity—The specific gravity of Rosin is not less than 1.07 and not more than 1.09 at 25° C.

Ash—Rosin yields not more than 0.1 per cent of ash, page 556.

Reaction—An alcoholic solution of Rosin is acid to litmus paper.

Acid value—The acid value of Rosin is not less than 150, page 578, using about 1 Gm. of the Rosin, accurately weighed.

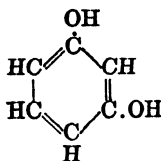
Storage—Preserve Rosin in well-closed containers.

U. S. P. Product of Rosin—Ceratum Resinæ.

RESORCINOL

Resorcinol

Resorcin.—Resorecin



$\text{C}_6\text{H}_6\text{O}_2$

Mol. wt. 110.11

Resorcinol, when dried for 18 hours over sulfuric acid, contains not less than 99.5 per cent of $\text{C}_6\text{H}_6\text{O}_2$.

Description—Resorcinol occurs as white, or nearly white, needle-shaped crystals, or powder. It has a faint, characteristic odor and a sweetish, followed by a bitter taste. It acquires a pink tint on exposure to light and air.

Solubility—One Gm. of Resorcinol dissolves in 1 cc. of water and in about 1 cc. of alcohol, at 25° C. It is freely soluble in glycerin and in ether, and is slightly soluble in chloroform.

Melting point—Resorcinol melts between 109° and 111° C., page 595.

Identification—

A: Dissolve 0.1 Gm. of Resorcinol in 2 cc. of sodium hydroxide T.S., add a drop of chloroform, and heat the mixture: an intense crimson color is produced, which changes to pale yellow on the addition of a slight excess of hydrochloric acid.

B: The addition of 3 drops of ferric chloride T.S. to 10 cc. of an aqueous solution of Resorcinol (1 in 200) produces a bluish violet color, which becomes brownish yellow on the addition of ammonia T.S.

Loss on drying—When dried over sulfuric acid for 18 hours, Resorcinol loses not more than 1 per cent of its weight.

Ash—Resorcinol yields not more than 0.05 per cent of ash, page 556.

Reaction—An aqueous solution of Resorcinol (1 in 20) is neutral or only faintly acid to litmus paper.

Phenol—An aqueous solution of Resorcinol (1 in 20) does not emit the odor of phenol when gently warmed.

Catechol—Add 0.5 cc. of lead acetate T.S. to 10 cc. of an aqueous solution of Resorcinol (1 in 20) previously mixed with 2 drops of diluted acetic acid: no turbidity is produced.

Assay—Dissolve about 1.5 Gm. of Resorcinol, previously dried over sulfuric acid for 18 hours and accurately weighed, in sufficient distilled water to make 500 cc. of solution. Transfer 25 cc. of this solution, representing one-twentieth of the weight of Resorcinol taken, to an iodine flask, add 50 cc. of tenth-normal bromine, dilute with 50 cc. of distilled water, add 5 cc. of hydrochloric acid, and at once stopper the flask. Shake the flask, allow it to stand for 1 minute, remove the stopper just sufficiently to introduce quickly 5 cc. of potassium iodide T.S., being careful that no bromine vapor escapes, and at once stopper the flask. Shake the latter thoroughly, remove the stopper, and rinse it and the neck of the flask with 20 cc. of distilled water, being sure that all of the rinsings run into the flask. Titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal bromine is equivalent to 0.001835 Gm. of $C_6H_6O_2$.

Storage—Preserve Resorcinol in well-closed, light-resistant containers.

RHEUM

Rhubarb

Rhubarb consists of the dried rhizome and roots of *Rheum officinale* Baillon or of *Rheum palmatum* Linné (Fam. *Polygonaceæ*) or of other species (excepting *Rheum rhaponticum*) or of hybrids of *Rheum*, grown in China and Tibet, deprived of periderm tissues.

Rhubarb yields not less than 30 per cent of diluted alcohol-soluble extractive, page 631.

Description—

Unground Rhubarb—In subcylindrical, barrel-shaped or flattened pieces, frequently showing a perforation; from 5 to 17 cm. in length and from 4 to 10 cm. in diameter; outer surface yellowish brown with lighter colored striations and

occasional patches of brown cork; more or less covered by a yellowish brown powder; hard; fracture uneven and granular, the fractured surface having a pinkish brown color; the smoothed, transverse surface of the rhizome showing a cambium line near the periphery transversely by radiate medullary rays projecting for a short distance within it; the large area within this circle of medullary rays containing stellate vascular bundles from 2 to 4 mm. in diameter, having an external xylem and internal phloem and radiating, yellowish brown, medullary rays; the stellate bundles being arranged in a more or less continuous circle (*Rheum palmatum*) or scattered irregularly (*Rheum officinale*); odor, aromatic, agreeable; taste, bitter and astringent.

Powdered Rhubarb—Dusky yellowish orange to moderate yellowish brown; rosette aggregates of calcium oxalate frequently exceeding 100 microns in diameter, and occasionally up to 190 microns; starch grains 2 to 25 microns in diameter, spheroidal, single and 2- to 4-compound, with central cleft hilum; fragments of medullary rays, the cells containing an amorphous, yellow substance, insoluble in alcohol but soluble in water and dissolving in ammonia T.S. with a pink color; tracheæ few, non-lignified, reticulate and spiral.

Anthraquinone compounds—Rhubarb becomes red upon the addition of alkalis.

Emodin and chrysophanic acid—Boil 0.1 Gm. of powdered Rhubarb with 10 cc. of an aqueous solution of potassium hydroxide (1 in 100), allow it to cool, filter, acidulate the filtrate with hydrochloric acid, and shake it with 10 cc. of ether: the ethereal layer becomes yellow as it stands. Shake this ethereal solution with 5 cc. of ammonia T.S.: the latter is colored red (*emodin*) and the ethereal layer remains yellow (*chrysophanic acid*).

European rhubarbs—Unground Rhubarb is firm in texture, not shrunken and shows more or less definite reticulations upon the outer surface.

Assay—Proceed as directed under *Diluted Alcohol-soluble Extractive*, page 631.

Storage—Preserve Rhubarb against attack by insects, page 5.

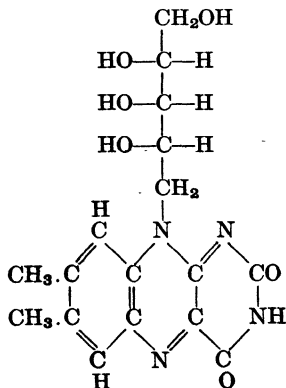
U. S. P. Products of Rhubarb—Extractum Rhei, Syrupus Rhei Aromaticus, Tinctura Rhei Aromatica.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

RIBOFLAVINUM

Riboflavin

Riboflav.—Lactoflavin, Vitamin B₂, Vitamin G



C₁₇H₂₀N₄O₆

Mol. wt. 376.36

Description—Riboflavin is an orange yellow, crystalline powder. It has a slight odor. When dry, it is not appreciably affected by diffused light, but in solution, especially in the presence of alkalies, it deteriorates quite rapidly, the deterioration being accelerated by light.

Solubility—One Gm. of Riboflavin dissolves in about 10,000 cc. of water at 25° C., but is more soluble in isotonic solution of sodium chloride. It is less soluble in alcohol, insoluble in ether and in chloroform, but very soluble in dilute alkalies.

Melting point—Riboflavin melts with decomposition at about 280° C., the bath being preheated to 250° C., page 595.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of Riboflavin is not less than -112° and not more than -122° when determined as follows: weigh accurately 50 mg. of Riboflavin, previously dried in the dark in a vacuum desiccator over sulfuric acid for 18 hours, and dissolve it in a mixture of 1.5 cc. of tenth-normal alcoholic sodium hydroxide and sufficient cold, carbon dioxide-free distilled water to make exactly 10 cc. of solution, and complete the determination of the rotation in a 100-mm. tube within 30 minutes after preparing the solution.

Identification—A solution of 1 mg. of Riboflavin in 100 cc. of distilled water is pale greenish yellow by transmitted light, and has an intense yellowish green fluorescence, which disappears upon the addition of mineral acids or alkalies.

Loss on drying—Dry about 0.5 Gm. of Riboflavin, accurately weighed, in a vacuum desiccator over sulfuric acid for 18 hours: the loss in weight is not more than 1.5 per cent.

Ash—The ash from 0.2 Gm. of Riboflavin is negligible, page 556.

Reaction—An aqueous solution of Riboflavin (1 in 10,000) is neutral to litmus paper.

Lumiflavin—Shake 25 mg. of Riboflavin with 10 cc. of chloroform for 5 minutes, then filter: the filtrate has no more color than an equal volume of a solution made by diluting 3 cc. of tenth-normal potassium dichromate with sufficient distilled water to make 1000 cc.

Nitrogen—Place about 0.3 Gm. of Riboflavin, previously dried for 18 hours in a vacuum desiccator over sulfuric acid and accurately weighed, in a Kjeldahl flask, add about 1 Gm. of benzoic acid, and determine the nitrogen content, page 598, digesting the mixture for at least 5 hours: it contains not less than 14.5 per cent and not more than 15.2 per cent of N.

Storage—Preserve Riboflavin in tight, light-resistant containers.

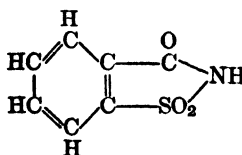
U. S. P. Product of Riboflavin—*Tabellæ Riboflavini*.

AVERAGE DOSE—Metric, 5 mg.—Apothecaries, $\frac{1}{12}$ grain.

SACCHARINUM

Saccharin

Saccharin.—Gluside, Benzosulfimide



$C_7H_5O_3NS$

Mol. wt. 183.18

Description—Saccharin occurs as white crystals, or as a white, crystalline powder. It is odorless or has a faint, aromatic odor. Saccharin in dilute aqueous solution is from 300 to 500 times as sweet as sucrose.

Solubility—One Gm. of Saccharin dissolves in 290 cc. of water and in 31 cc. of alcohol, at 25° C. One Gm. dissolves in about 25 cc. of boiling water. It is slightly soluble in chloroform and in ether, and is readily dissolved by diluted

solution of ammonia, by solutions of alkali hydroxides, and by solutions of alkali bicarbonates with the evolution of carbon dioxide.

Melting point—The melting point of Saccharin is not below 222° C., page 595.

Identification—

A: Dissolve about 0.1 Gm. of Saccharin in 5 cc. of an aqueous solution of sodium hydroxide (1 in 20), evaporate the solution to dryness, and gently fuse the residue over a small flame until it no longer evolves ammonia. Allow the residue to cool, dissolve it in 20 cc. of distilled water, neutralize the solution with diluted hydrochloric acid, and filter: the addition of a drop of ferric chloride T.S. to the filtrate produces a violet color.

B: Mix 20 mg. of Saccharin with 40 mg. of resorcinol, add 10 drops of sulfuric acid, and heat the mixture over a small flame until it acquires a dark green color. Allow it to cool, add 10 cc. of distilled water, and an excess of sodium hydroxide T.S.: a fluorescent green liquid results.

Loss on drying—When dried over sulfuric acid for 18 hours, Saccharin loses not more than 1 per cent of its weight.

Ash—Saccharin yields not more than 0.2 per cent of ash, page 556.

Carbonizable substances—A solution prepared by dissolving 0.2 Gm. of Saccharin in 5 cc. of sulfuric acid, and kept at a temperature of from 48° and 50° C. for 10 minutes, develops no more color than matching fluid A, page 563.

Reaction—A saturated, aqueous solution of Saccharin is acid to litmus paper.

Ammonium compounds—Warm a mixture of 0.5 Gm. of Saccharin, 1 Gm. of magnesium oxide, and 10 cc. of distilled water: no odor of ammonia is perceptible.

Glucose and lactose—A solution of 0.2 Gm. of Saccharin in 5 cc. of sodium hydroxide T.S. is clear, and, when mixed with 5 cc. of alkaline cupric tartrate T.S., does not deposit cuprous oxide on heating.

Heavy metals—Dissolve 2 Gm. of Saccharin in 4 cc. of ammonia T.S., and dilute to 40 cc. with distilled water. Add 1 drop of phenolphthalein T.S., followed by diluted hydrochloric acid until the pink color is just discharged, then add 2 cc. of normal hydrochloric acid, and dilute immediately to 50 cc. with distilled water. Mix well, and rub the inner wall of the vessel with a glass rod until crystallization begins. Allow the solution to stand for 1 hour, then filter through a dry filter rejecting the first 10 cc. of the filtrate: the heavy metals limit, page 586, for Saccharin determined in 25 cc. of the subsequent filtrate is 20 parts per million.

Benzoic and salicylic acids—Add ferric chloride T.S., drop by drop, to 10 cc. of a hot, saturated, aqueous solution of Saccharin: no precipitate or violet color appears in the liquid.

Storage—Preserve Saccharin in well-closed containers.

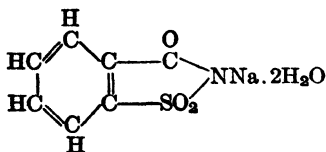
U. S. P. Product of Saccharin—Saccharinum Sodicum.

NOTE—A 60-mg. portion of Saccharin is equivalent as a sweetening agent to approximately 30 Gm. of sucrose.

SACCHARINUM SODICUM

Saccharin Sodium

Saccharin. Sod.—Saccharinum Solubile U. S. P. XI, Soluble Saccharin U. S. P. XI, Soluble Gluside, Sodium Benzosulfimide



Mol. wt. 241.20

Description—Saccharin Sodium occurs as white crystals, or as a white crystalline powder. It is odorless, or has a faint, aromatic odor, and an intensely sweet taste even in dilute solutions. Saccharin Sodium in dilute aqueous solution is from 300 to 500 times as sweet as sucrose. When in powdered form it usually contains about half the amount of water of hydration due to effervescence.

Solubility—One Gm. of Saccharin Sodium dissolves in 1.5 cc. of water and in about 50 cc. of alcohol, at 25° C.

Identification—

A: Saccharin Sodium responds to the *identification tests* under *Saccharinum*, page 394.

B: The residue obtained by igniting Saccharin Sodium responds to the test for sodium, page 592.

C: To 10 cc. of an aqueous solution of Saccharin Sodium (1 in 10), add 1 cc. of hydrochloric acid: a crystalline precipitate of saccharin is produced.

Reaction—An aqueous solution of Saccharin Sodium (1 in 10) is neutral or only slightly alkaline to litmus paper, and produces no red color with phenolphthalein T.S.

Heavy metals—Dissolve 2 Gm. of Saccharin Sodium in 48 cc. of distilled water, add 2 cc. of normal hydrochloric acid, mix well, and rub the inner wall of the vessel with a glass rod until crystallization begins. Allow the solution to stand for 1 hour, then filter through a dry filter, rejecting the first 10 cc. of filtrate: the heavy metals limit, page 586, for Saccharin Sodium, determined in 25 cc. of the subsequent filtrate, is 20 parts per million.

Benzoate and salicylate—Add 3 drops of ferric chloride T.S. to 10 cc. of an aqueous solution of Saccharin Sodium (1 in 20), previously acidulated with 5 drops of acetic acid: no precipitate or violet color appears in the liquid.

Other tests—Saccharin Sodium meets the requirements of the tests for *carbonizable substances*, *glucose and lactose*, and for *ammonium compounds* under *Saccharinum*, page 394.

Storage—Preserve Saccharin Sodium in well-closed containers.

U. S. P. Product of Saccharin Sodium—*Tabellæ Saccharini Sodici*.

NOTE—A 60-mg. portion of Saccharin Sodium is equivalent in sweetening power to approximately 30 Gm. of sucrose.

SANTALUM RUBRUM

Red Saunders

Santal. Rub.

Red Saunders is the heart-wood of *Pterocarpus santalinus* Linné filius (Fam. *Leguminosæ*).

Description—

Unground Red Saunders—Usually in the form of a coarse powder, of a purplish, moderately reddish orange or reddish brown color, or in dusky red to dark reddish orange chips. It is nearly odorless, and has a slightly astringent taste.

Powdered Red Saunders—Wood-fibers numerous, mostly irregular in outline, with sharply pointed and occasionally forked ends, from 300 to 750 microns in length, walls very thick, porous, orange to yellowish orange, unevenly thickened and strongly lignified, and the lumina filled with a fine, granular content; tracheæ few with simple or bordered pores and filled with orange to yellow, resinous masses; occasionally fragments showing medullary ray cells in narrow elliptical groups 1 cell wide and from 3 to 6 cells deep; crystal-fibers few with calcium oxalate in the form of monoclinic prisms, from 8 to 20 microns in length. Mounts in chloral hydrate T.S. are of a deep, reddish orange color.

Identification—

A: Add 0.5 Gm. of Red Saunders to 10 cc. of alcohol: the mixture becomes distinctly reddish brown to reddish orange.

B: Add 0.5 Gm. of Red Saunders to 10 cc. of ether: the solution assumes a brown color, and when held in a bright light shows a distinct greenish yellow fluorescence.

Purity—Add 0.5 Gm. of Red Saunders to 10 cc. of distilled water, agitate, and filter the mixture: the filtrate is colorless to weak yellow.

SAPO DURUS

Hard Soap

Sapo Dur.—Soap

Hard Soap is a soda soap.

Description—Hard Soap occurs as a white or whitish solid, in the form of bars, hard, yet easily cut when fresh, or as a fine, white or yellowish white powder. It has a faint odor, free from rancidity.

Solubility—Hard Soap is slowly soluble in water and in alcohol, more readily, however, with the aid of heat.

Reaction—An aqueous solution of Hard Soap is alkaline to indicators.

Loss on drying—Dissolve about 0.5 Gm. of Hard Soap, accurately weighed in 10 cc. of alcohol, evaporate the mixture to dryness in a tared beaker containing 1 Gm. of washed sand which has been previously dried at 110° C., and dry the residue to constant weight at 110° C.: the loss in weight does not exceed 36 per cent for the unpowdered Soap or 10 per cent for the powdered Soap.

Limit of saturated acids—A solution of a quantity of Hard Soap, corresponding to 0.64 Gm. of dried soap, in 25 cc. of hot alcohol does not gelatinize on cooling to 20° C.

Heavy metals—A 10-cc. portion of an aqueous solution of Hard Soap (1 in 20) remains unchanged in color upon the addition of ammonium sulfide T.S., and, upon acidulating another portion of 10 cc. of the solution with hydrochloric acid and filtering, the filtrate remains unchanged in color when an equal volume of hydrogen sulfide T.S. is added and the mixture allowed to stand well stoppered, in a warm place for 30 minutes.

Sodium chloride, carbonate, silica, or other alcohol-insoluble substances—Dissolve about 10 Gm. of Hard Soap, accurately weighed, in 100 cc. of neutralized alcohol, with the aid of heat. Transfer the undissolved residue, if any, to a tared filter which has been dried at 100° C., and wash it thoroughly with boiling neutralized alcohol: the weight of the residue after drying at 100° C. does not exceed 1 per cent of the weight of the Soap taken for the test.

Silica or other water-insoluble substances—Thoroughly wash the residue obtained in the determination of *sodium chloride, etc.*, with distilled water, and dry it for 4 hours at 100° C.: the weight of the dried residue does not exceed 0.15 per cent of the weight of the Soap taken for the test.

Alkali hydroxides or free fatty acids—Dissolve 2.5 Gm. of Hard Soap in 50 cc. of boiling neutralized alcohol, filter while hot, and wash the filter thoroughly with boiling neutralized alcohol: the filtrate requires for neutralization not more than 0.2 cc. of tenth-normal sulfuric acid or not more than 0.2 cc. of tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator.

Alkali carbonates—Wash the filtered residue obtained in the determination of *alkali hydroxides or free fatty acids* with 50 cc. of boiling distilled water, cool, and titrate the aqueous filtrate with tenth-normal sulfuric acid, using methyl orange T.S. as the indicator: not more than 2 cc. of tenth-normal acid is required.

Characteristics of the combined fatty acids—Dissolve about 30 Gm. of Hard Soap

in hot distilled water in a beaker, add a slight excess of diluted sulfuric acid, and heat on a water bath until the liberated fatty acids form a transparent layer. Cool the mixture, remove the aqueous layer, and wash the acids with several portions of boiling distilled water, cooling after each addition of distilled water until the last washing, after cooling, is neutral to methyl orange T.S. Melt the acids in a small beaker, and allow them to stand in a molten condition until any water which may be present has collected in the bottom of the beaker. Filter the melted acids through a dry filter paper in a warm oven. The solidifying point of the combined fatty acids is not below 18° and not above 23° C., page 577, the acid value is not less than 185 and not more than 205, using about 1 Gm. of the combined fatty acids, accurately weighed, page 578, and the iodine value is not less than 83 and not more than 92, page 579.

Storage—Preserve Hard Soap in well-closed containers.

U. S. P. Products of Hard Soap—Linimentum Camphoræ et Saponis, Linimentum Chloroformi.

SAPO MOLLIS MEDICINALIS

Medicinal Soft Soap

Sapo Moll.—Sapo Mollis U. S. P. XI, Soft Soap U. S. P. XI, Green Soap

Medicinal Soft Soap is a potassium soap made by the saponification of vegetable oils, excluding coconut oil and palm kernel oil, without the removal of glycerin. Soft Soap may be prepared extemporaneously in the following manner:

THE VEGETABLE OIL.....	380	Gm.
OLEIC ACID.....	20	Gm.
POTASSIUM HYDROXIDE.....	91.7	Gm.
GLYCERIN.....	50	cc.
DISTILLED WATER, a sufficient quantity,		
To make about.....	1000	Gm.

Mix the oil and oleic acid, and heat the mixture to about 80° C. Dissolve the potassium hydroxide in a mixture of the glycerin and 100 cc. of distilled water, and add the solution, while it is still hot, to the hot oil. Stir the mixture vigorously until an emulsion is formed, using mechanical stirring if desired, then heat the mixture on a hot plate, with constant vigorous stirring, until it becomes homogeneous and a small portion dissolves completely in hot water, producing a clear solution. Add sufficient hot distilled water to make the soap weigh 1000 Gm., and incorporate the water in the soap until it is uniformly distributed and the soap is of the same consistency throughout.

NOTE—The vegetable oil to be used in the formula given above may be corn, cottonseed, linseed, olive, soya bean, or similar oils which have

a saponification value, page 579, not greater than 205, and an iodine value, page 579, not less than 80. Since glycerin is added only to accelerate the saponification, it may be omitted if desired.

The quantity of potassium hydroxide given in the formula is based on an alkalinity equivalent to 85 per cent of KOH. If the potassium hydroxide is of any other strength, a proportionately larger or smaller quantity should be taken.

Medicinal Soft Soap complies with the following requirements:

Description—Medicinal Soft Soap occurs as a soft, unctuous, yellowish white to brownish or greenish yellow, transparent to translucent mass. It has a slight, characteristic odor, often suggesting the oil from which it was prepared, and an alkaline taste.

Reaction—An aqueous solution of Medicinal Soft Soap (1 in 20) is alkaline to indicators.

Water—Place about 10 Gm. of Medicinal Soft Soap, quickly weighed to the nearest centigram, in the distilling flask of the apparatus for the *Moisture Method by Toluene Distillation*, page 629. The Soap is most conveniently weighed in a boat of metal foil, of a size that will just pass through the neck of the flask. Place 250 cc. of toluene and 10 Gm. of anhydrous barium chloride in the flask, connect the flask through a ground-glass joint to the distilling apparatus, and fill the receiving tube with toluene. Determine the water as directed under *Moisture Method by Toluene Distillation*, page 629, beginning with the words "Heat the toluene in the flask." The volume of water found corresponds to not more than 52 per cent by weight of the Medicinal Soft Soap taken.

Alcohol-insoluble substances—Dissolve about 5 Gm. of Medicinal Soft Soap, accurately weighed, in 100 cc. of hot, neutralized alcohol, collect the residue, if any, on a filter, thoroughly wash it with hot, neutralized alcohol, and dry for 4 hours at 100° C.: the weight of the residue does not exceed 3 per cent of the weight of Soap taken.

Free alkali hydroxides—To the combined filtrate and washings obtained in the determination of *alcohol-insoluble substances*, add 0.5 cc. of phenolphthalein T.S.: a pink color is produced. Titrate the solution with tenth-normal sulfuric acid until the pink color is just discharged: the volume of tenth-normal acid consumed corresponds to not more than 0.25 per cent of KOH. Each cc. of tenth-normal sulfuric acid is equivalent to 0.00561 Gm. of KOH.

Alkali carbonates—Wash the filter containing the *alcohol-insoluble residue* with 50 cc. of boiling distilled water, cool, and titrate the aqueous filtrate with tenth-normal sulfuric acid, using methyl orange T.S. as the indicator: not more than 0.5 cc. of tenth-normal sulfuric acid per Gm. of Medicinal Soft Soap originally taken is required for the neutralization.

Unsaponified matter—A solution of Medicinal Soft Soap in hot distilled water (1 in 20) is nearly clear.

Characteristics of the liberated fatty acids—Dissolve about 25 Gm. of Medicinal Soft Soap in 500 cc. of boiling distilled water in a beaker, add gradually 50 cc. of diluted sulfuric acid, and heat the mixture on a water bath until the liberated acids form a transparent layer. Decant the fatty acids into a separator, and wash them with 50-cc. portions of hot distilled water until the last washing, when cool, is neutral to methyl orange T.S. Transfer the fatty acids to a dry beaker, and allow them to stand in a warm oven until any water which may be present has separated. Then filter the acids through a dry filter in the warm oven. The acid value of the fatty acids is not more than 205, using about 1 Gm. of the fatty acids, accurately weighed, page 578, and the iodine value of the fatty acids is not less than 85, using from 0.15 to 0.2 Gm. of the acids for the test, page 579.

Storage—Preserve Medicinal Soft Soap in well-closed containers.

U. S. P. Product of Medicinal Soft Soap—Linimentum Saponis Mollis.

SARSAPARILLA

Sarsaparilla

Sarsap.

Sarsaparilla is the dried root of *Smilax aristolochiæfolia* Miller, known in commerce as Mexican Sarsaparilla; or of *Smilax Regelii* Killip and Morton, known in commerce as Honduras Sarsaparilla; or of undetermined species of *Smilax*, respectively known in commerce as Ecuadorian and Central American Sarsaparilla (Fam. *Liliacæ*).

Sarsaparilla contains not more than 2 per cent of foreign organic matter, other than the rhizome and crown portion, page 628. Mexican and Ecuadorian Sarsaparillas contain not more than 10 per cent of rhizome and aerial stem portions. Mexican Sarsaparilla yields not more than 4 per cent of acid-insoluble ash, page 629. The other official varieties conform to the standards for acid-insoluble ash under Vegetable and Animal Drugs in the General Notices, page 5.

Description—Sarsaparilla is nearly odorless; taste mucilaginous, somewhat sweetish and acrid.

Unground Mexican Sarsaparilla—Roots long, from 3.5 to 6 mm. in diameter, frequently attached to a crown having one or more stout stems; usually shrunken, forming sharp longitudinal ridges and broad furrows; externally light grayish brown or weak reddish brown to yellowish brown; the furrows may contain adhering earth; finely hairy; nearly devoid of branches of fibrous rootlets; fracture of cortex brittle, of central cylinder tough and fibrous; cortex mealy and pale orange or light yellowish brown and horny; woody zone yellow and porous; pith lighter colored and distinct.

Unground Ecuadorian Sarsaparilla—Roots long, from 2 to 6 mm. in diameter, frequently attached to a crown having one or more stout purplish stems; externally reddish brown to purplish, longitudinally wrinkled or furrowed with occasional fibrous rootlets; fracture of cortex short to fibrous, of central cylinder tough and fibrous; cortex brown to reddish brown, woody zone yellowish brown and porous; pith white.

Unground Honduras Sarsaparilla—Roots long, from 2 to 5 mm., rarely 6 mm. in diameter and bound together by roots of the same plant into compact cylindrical bundles from 8 to 15 cm. in diameter; externally reddish brown or dark brown, longitudinally wrinkled or finely furrowed with occasional fibrous rootlets; fracture short, sometimes tough and fibrous in the central cylinder; internally showing a moderate brown to yellowish orange cortex, a light yellow and porous woody zone and a lighter colored pith.

Unground Central American Sarsaparilla—Roots long, from 1 to 4, rarely 5 mm. in diameter; externally weak reddish brown to moderate yellowish brown, longitudinally wrinkled, occasionally nearly smooth, rarely furrowed and bearing numerous coarse fibrous rootlets; fracture short or tough and fibrous in the central cylinder; internally showing a white to brown cortex, a yellow, porous, woody zone and a lighter colored pith.

Histology—An epidermal layer with basal portions of root hairs; a hypodermis of several layers of strongly lignified cells, the walls being uniformly thickened, except in Mexican and some Ecuadorian Sarsaparilla in which the inner walls are only slightly thickened; a cortex composed of parenchyma cells mostly containing starch; some containing resin or raphides of calcium oxalate, and an endodermis of a single layer of strongly lignified cells, the walls being uniformly

thickened except in Mexican and some Ecuadorian Sarsaparilla in which the outer walls are less thickened than the inner and radial walls; a central cylinder composed of a pericambium which in Ecuadorian Sarsaparilla is composed of thick-walled and lignified cells, a poly-arch, radial fibrovascular bundle and a pith of starch-bearing parenchyma cells; tracheæ large, oval in transverse section; the phloem in small strands near the periphery of the bundle.

Powdered Sarsaparilla—Pale brown to weak yellowish orange; starch grains numerous, single or compound, the individual grains from 3 to 23 microns in diameter, spherical, or biconvex or spherical-tetrahedral and frequently with a central, crescentic, 3- to 4-angled, or winged cleft; calcium oxalate in raphides occurring singly or in groups, up to 150 microns in length; cells of the hypodermis and endodermis with reddish orange to yellow, porous walls and in Mexican and Ecuadorian Sarsaparilla showing an uneven or irregular thickening, the cells being from 80 to 500 microns in length; fragments of tracheæ with simple and bordered pores or scalariform or reticulate thickenings, associated with wood fibers having very slightly lignified and porous walls.

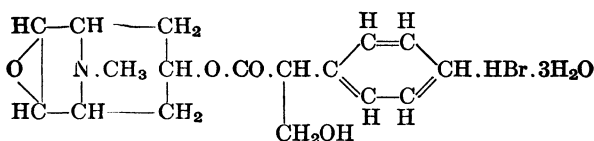
Storage—Preserve Sarsaparilla against attack by insects, page 5.

U. S. P. Products of Sarsaparilla—Fluidextractum Sarsaparillæ, Syrupus Sarsaparillæ Compositus.

SCOPOLAMINÆ HYDROBROMIDUM

Scopolamine Hydrobromide

Scopol. Hydrobrom.—Hyoscyne Hydrobromide



$\text{C}_{17}\text{H}_{21}\text{NO}_4 \cdot \text{HBr} \cdot 3\text{H}_2\text{O}$

Mol. wt. 438.32

The hydrobromide of lævorotatory scopolamine obtained from plants of the *Solanaceæ*.

Description—Scopolamine Hydrobromide occurs as colorless or white crystals or as a white, granular powder. It is odorless, and is slightly efflorescent in dry air.

Caution—*Scopolamine Hydrobromide is extremely poisonous.*

Solubility—One Gm. of Scopolamine Hydrobromide dissolves in 1.5 cc. of water and in 20 cc. of alcohol, at 25° C. It is slightly soluble in chloroform, and insoluble in ether.

Melting point—When rendered anhydrous by drying at 100° C., Scopolamine Hydrobromide melts between 193° and 195° C., the bath being preheated to 180° C., page 595.

Optical rotation—The specific rotation $[\alpha]_D^{25}$ of anhydrous Scopolamine Hydrobromide, determined in an aqueous solution containing the equivalent of 5 Gm. of anhydrous Scopolamine Hydrobromide in 100 cc. of solution and using a 100-mm. tube, is not less than -24° and not more than -26° , page 601.

Identification—

A: Add 1 drop of nitric acid to about 1 mg. of Scopolamine Hydrobromide and evaporate to dryness in a small porcelain evaporating dish on a steam bath. To the residue add 3 drops of alcoholic potassium hydroxide T.S., and warm on the steam bath to remove the alcohol: the residue has an intense purple color.

B: Add a few drops of chlorine T.S. to 1 cc. of an aqueous solution of Scopolamine

Hydrobromide (1 in 20), and shake the mixture with 1 cc. of chloroform: the latter assumes a brownish color.

Loss on drying—When dried to constant weight at 100° C., Scopolamine Hydrobromide loses not more than 13 per cent of its weight.

Ash—The ash from 0.1 Gm. of Scopolamine Hydrobromide is negligible, page 556.

Reaction—An aqueous solution of Scopolamine Hydrobromide (1 in 20) is neutral, or at most only slightly acid to litmus paper.

Apoatropine—Add 0.05 cc. of tenth-normal potassium permanganate to 15 cc. of an aqueous solution of Scopolamine Hydrobromide (1 in 100): the solution is not completely decolorized within 5 minutes.

Other foreign alkaloids—Add a few drops of ammonia T.S. to 1 cc. of an aqueous solution of Scopolamine Hydrobromide (1 in 20): the mixture is not turbid. Add potassium hydroxide T.S. to another 1-cc. portion of the aqueous solution: the mixture exhibits only a transient whitish turbidity.

Storage—Preserve Scopolamine Hydrobromide in tight, light-resistant containers.

AVERAGE DOSE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{20}$ grain.

SENNA

Senna

Senn.—Senna Leaves

Senna consists of the dried leaflets of *Cassia acutifolia* Delile, known in commerce as Alexandria Senna, or of *Cassia angustifolia* Vahl, known in commerce as Tinnevely Senna (Fam. *Leguminosæ*).

Senna contains not more than 8 per cent of its stems, and not more than 2 per cent of its pods or other foreign organic matter, and yields not more than 3 per cent of acid-insoluble ash, page 629.

Description—

Unground Alexandria Senna—Inequilaterally lanceolate or lance-ovate, frequently broken; from 1.5 to 3.5 cm. in length and from 5 to 10 mm. in width, unequal at the base, with very short, stout petiolules; acutely cuspidate, entire, brittle, subcoriaceous; hairs short and somewhat appressed, few on the upper surface, more numerous on the lower surface, where they occur spreading on the midrib, especially on the lower part; color weak yellow to light grayish green to pale olive; odor characteristic; taste mucilaginous, slightly bitter.

Unground Tinnevely Senna—Usually unbroken, from 2 to 5 cm. in length, from 6 to 15 mm. in width; acute at the apex, slightly hairy; weak yellow to pale olive and otherwise resembling Alexandria Senna.

Histology—Epidermal cells polygonal, with straight walls and frequently containing mucilage; stomata numerous, broadly elliptical, mostly from 20 to 35 microns in length, usually bordered by 2 neighbor-cells with their long axes parallel to that of the stoma, and rarely, though more frequently in Alexandria Senna, a third epidermal cell at the end of the stoma; hairs non-glandular, 1-celled, conical, often curved, with thick papillose walls, from 100 to 350 microns in length; palisade cells in a single layer underlying both surfaces excepting in the midrib region where they occur only beneath the upper epidermis; a meristeles occurs in the midrib composed of several radially arranged fibrovascular bundles, the latter separated by narrow medullary rays and supported above and below by arcs of lignified pericyclic fibers; calcium oxalate in rosettes in the spongy parenchyma and in 6- to 8-sided prisms in the crystal-fibers, on the outer surface of each group of pericyclic fibers.

Powdered Senna—Dusky greenish yellow to light olive brown; displaying fragments of veins bearing lignified tracheæ and crystal-fibers, isolated hairs, masses

of palisade and spongy parenchyma, fragments of epidermis with stomata, free calcium oxalate rosettes and prisms from 10 to 20 microns in length. In powdered Alexandria Senna the hairs are more numerous than in powdered Tinnevely Senna.

Identification—Mix 0.5 Gm. of powdered Senna with 10 cc. of an alcohol solution of potassium hydroxide (1 in 10), boil the mixture for about 2 minutes, dilute it with 10 cc. of distilled water, and filter. Acidify the filtrate with hydrochloric acid, shake it with ether, remove the ether layer, and shake it with 5 cc. of ammonia T.S.: the latter is colored orange or bluish red.

U. S. P. Products of Senna—Fluidextractum Sennæ, Syrupus Sennæ.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SERUM ANTIMENINGOCOCCICUM

Antimeningococcic Serum

Serum Antimeningococ.—Antimeningococcus Serum, Meningococcus Serum, Meningitis Serum

Antimeningococcic Serum is obtained from the blood of an animal immunized with cultures of the several types of meningococci (*Neisseria intracellularis*) which prevail in the United States. Antimeningococcic Serum complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Antimeningococcic Serum is a yellowish, clear, or slightly turbid liquid, having a faint odor of serum or having an odor due to the presence of a preservative; it may have a slight, granular deposit.

Regulations—Antimeningococcic Serum must come from healthy animals and must be sterile and free from harmful substances detectable by animal inoculation. It must not contain an excessive proportion of preservative (not more than 0.35 per cent of phenol or cresol if either of these is used).

The outside label must bear the name *Antimeningococcic Serum*, the manufacturer's lot number of the Serum, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the Serum may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Antimeningococcic Serum at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20 cc.

SERUM ANTIPNEUMOCOCCICUM

Antipneumococcic Serum—Type Specific

Serum Antipneumococ.—Antipneumococcus Serum, Pneumonia Serum

Antipneumococcic Serum is obtained from the blood of an animal which has been immunized with cultures of a pneumococcus (*Diplococcus pneumoniae*) of one of the types for which a serum has been prepared and which has been standardized or is released by the National Institute

of Health of the United States Public Health Service, and complies with the requirements of that agency of the Government.

Description—Antipneumococcic Serum is a yellowish, clear, opalescent, or slightly turbid liquid, having a faint odor of serum or having an odor due to the presence of a preservative; it may have a slight, granular deposit.

Antipneumococcic Serum must come from healthy animals, and must be sterile and free from harmful substances detectable by animal inoculation. It must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol if either of these is used).

Regulations—The potency of Antipneumococcic Serum shall be expressed in units of protective antibody, and the unit shall be that established by the National Institute of Health of the United States Public Health Service.

The outside label must bear the name *Antipneumococcic Serum*, the specific type or types of pneumococcus represented, the minimum number of units in the package, the genus of animal employed, the manufacturer's lot number of the Serum, the name, address, and license number of the manufacturer, and a statement of the date beyond which the Serum may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Antipneumococcic Serum at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, from 20,000 to 100,000 units.

Caution—*Type XIV Antipneumococcic Serum produced by immunization of the horse should not be administered to persons of blood group "A."*

SERUM HUMANUM NORMALE

Normal Human Serum

Ser. Human. Nor.—Human Serum

Normal Human Serum is the sterile serum obtained by pooling approximately equal amounts of the liquid portion of coagulated whole blood from eight or more humans (*Homo sapiens*) who have been certified by a qualified doctor of medicine as free from any disease which is transmissible by blood transfusion at the time of drawing the blood. Each bleeding is drawn under aseptic precautions into individual sterile centrifuge bottles and allowed to coagulate for at least 12 hours and not more than 24 hours. The cell-free serum is separated by centrifugation, and transferred to a pool by means of a closed system. Sterility tests are made, a preservative is added, the serum is passed through a bacteria-excluding filter and finally distributed into the final containers through a closed system. Normal Human Serum complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Normal Human Serum may be dispensed as liquid serum or in a dried condition. Normal Human Serum must be free from harmful substances detectable by animal inoculation, and must not contain an excessive amount of preservative.

Liquid serum—Freshly collected Normal Human Serum is a slightly opalescent liquid of a faint yellowish or amber color, and practically odorless in the absence of a preservative possessing an odor. A slight, granular deposit or increased opalescence may develop on standing.

Dried serum—This is made from liquid Normal Human Serum, frozen quickly, within 24 hours from separation from the clot. The Serum should be manipulated while freezing to avoid formation of a solid mass and then dried from the frozen state under vacuum. It contains not more than 1 per cent moisture as determined by exposing 1 or 2 Gm. of the sample, evenly distributed, in a weighing bottle not less than 60 mm. in diameter in a vacuum desiccator at less than 1 mm. pressure over fresh phosphorus pentoxide at room temperature until the weight remains constant to the third decimal. It has a light yellow to deep cream color, is microscopically of a honeycomb-like structure and shows no evidence of fusion.

Regulations—The outside label must bear the name *Normal Human Serum* and indicate the volume of original Normal Human Serum represented in the container, the manufacturer's lot number of the Serum, the name, address, and the license number of the manufacturer, and the date beyond which the quality of the contents may not be maintained.

Storage—Preserve the liquid Serum at a temperature between 2° and 10° C. Dried Serum must not be exposed to excessive heat. Normal Human Serum must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intravenous, 500 cc.

SERUM IMMUNE MORBILLOSI HUMANUM

Human Measles Immune Serum

Ser. Immun. Morbill. Human.—Measles Convalescent Serum

Human Measles Immune Serum is sterile serum obtained from the blood of a healthy human (*Homo sapiens*) who has survived an attack of measles. Human Measles Immune Serum complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Human Measles Immune Serum is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Human Measles Immune Serum must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The outside label must bear the name *Human Measles Immune Serum*, the manufacturer's lot number of the Serum, the name, address, and license number of the manufacturer, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained.

Storage—Preserve Human Measles Immune Serum at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20 cc.; prophylactic, 10 cc.

SERUM IMMUNE SCARLATINÆ HUMANUM

Human Scarlet Fever Immune Serum

Ser. Immun. Scarlet. Human.—Scarlet Fever Convalescent Serum

Human Scarlet Fever Immune Serum is a sterile serum obtained from the blood of a healthy human (*Homo sapiens*) who has survived an attack of scarlet fever. Human Scarlet Fever Immune Serum complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Human Scarlet Fever Immune Serum is a transparent or slightly opalescent liquid of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Human Scarlet Fever Immune Serum must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The outside label must bear the name *Human Scarlet Fever Immune Serum*, the manufacturer's lot number of the Serum, the name, address, and license number of the manufacturer, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained.

Storage—Preserve Human Scarlet Fever Immune Serum at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20 cc.; prophylactic, 10 cc.

SEVUM PRÆPARATUM

Prepared Suet

Sev. Præp.—Mutton Suet

Prepared Suet is the internal fat of the abdomen of the sheep, *Ovis aries* Linné (Fam. *Bovidae*), purified by melting and straining.

Description—Prepared Suet is a white, solid fat, having, when fresh, a slight, characteristic odor and a bland taste. It becomes rancid on prolonged exposure to the air and must not then be used.

Solubility—Prepared Suet is insoluble in water and in cold alcohol. One part of Prepared Suet dissolves in about 45 parts of boiling alcohol and in about 60 parts of ether. It slowly separates in crystalline form from its solution in purified benzin when allowed to stand in a stoppered flask.

Melting and congealing points—Prepared Suet melts between 45° and 50° C., page 595, and congeals between 37° and 40° C., page 566.

Saponification value—The saponification value of Prepared Suet is not less than 193 and not more than 200, page 579.

Iodine value—The iodine value of Prepared Suet is not less than 33 and not more than 48, page 579.

Acid value—The free fatty acids in 10 Gm. of Prepared Suet require for neutralization not more than 6 cc. of tenth-normal sodium hydroxide, page 578.

Storage—Preserve Prepared Suet in a cold place, in well-closed containers.

SINAPIS NIGRA

Black Mustard

Sinap. Nig.—Brown Mustard

Black Mustard is the dried ripe seed of *Brassica nigra* (Linné) Koch or of *Brassica juncea* (Linné) Czerniaew, or of varieties of these species (Fam. *Cruciferae*).

Black Mustard contains not more than 5 per cent of other seeds or other foreign organic matter, page 628, and yields not less than 0.6 per cent of allyl isothiocyanate (C_3H_5NCS).

Description—

Unground Black Mustard—Spheroidal or irregularly spheroidal, from 1 to 1.6 mm. in diameter; testa dusky red to moderate yellowish brown, minutely pitted or reticulate; embryo dusky yellowish orange to moderate yellow, oily, with 2 large cotyledons; odor when dry, slight; on crushing and moistening, very irritating, strongly pungent, characteristic; taste strongly pungent, acrid.

Powdered Black Mustard—Light olive brown; consisting mostly of tissues of the embryo, the cells containing small aleurone grains and a fixed oil, the latter forming in large globules on the addition of chloral hydrate T.S.; fragments of seed-coat conspicuous, with large polygonal areas, enclosing small reddish orange to yellow stone cells, each of the latter with a dark lumen; few or no starch grains.

In the preparation of powdered Black Mustard, a portion of its fixed oil and a portion of its seed-coat may be removed to facilitate the powdering.

Assay—Place 5 Gm. of Black Mustard, in powdered form, preferably coarse, in a 200-cc. flask, add 100 cc. of distilled water, stopper tightly, and macerate for 2 hours at about 37° C. Then add 20 cc. of alcohol, and distil about 70 cc. into a 100-cc. graduated flask containing 10 cc. of ammonia T.S. and 20 cc. of tenth-normal silver nitrate. Mix thoroughly, stopper the flask, allow the mixture to stand over night, then heat it in a bath of boiling water, cool, add distilled water to make 100 cc. of mixture, and filter through a dry filter, rejecting the first portions of the filtrate. Acidify 50 cc. of the filtrate, representing 2.5 Gm. of Black Mustard, with about 5 cc. of nitric acid, and titrate the mixture with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.004958 Gm. of allyl isothiocyanate.

U. S. P. Product of Black Mustard—Emplastrum Sinapis.

AVERAGE DOSE—Emetic, Metric, 10 Gm.—Apothecaries,
2½ drachms.

SODII BENZOAS

Sodium Benzoate

Sod. Benz.

 $C_6H_5.COONa$

Mol. wt. 144.11

Sodium Benzoate, when dried at 110° C. for 6 hours, contains not less than 99 per cent of $C_6H_5.COONa$.

Description—Sodium Benzoate is a white, odorless, or nearly odorless, granular or crystalline powder. It is stable in air.

Solubility—One Gm. of Sodium Benzoate dissolves in 2 cc. of water and in 50 cc. of a mixture of 47.5 cc. of alcohol and 3.7 cc. of water at 25° C.

Identification—

A: When heated, Sodium Benzoate fuses, emitting vapors having a characteristic odor, then chars, and finally leaves a residue of sodium carbonate and carbon.

B: Sodium Benzoate responds to the tests for sodium, page 592, and for benzoate, page 588.

Loss on drying—When dried for 6 hours at 110° C., Sodium Benzoate loses not more than 1 per cent of its weight.

Alkalinity—Dissolve 2 Gm. of Sodium Benzoate in 20 cc. of hot distilled water, and add 2 drops of phenolphthalein T.S.: the pink color produced, if any, is discharged by the addition of 0.2 cc. of tenth-normal sulfuric acid.

Heavy metals—Dissolve 2 Gm. of Sodium Benzoate in 45 cc. of distilled water, add dropwise with vigorous stirring 5 cc. of diluted hydrochloric acid, and filter. Use 25 cc. of the filtrate for the test: the heavy metals limit, page 586, for Sodium Benzoate is 20 parts per million.

Chlorinated compounds—Dissolve 1 Gm. of Sodium Benzoate in 10 cc. of distilled water in a separator, add 10 cc. of diluted sulfuric acid, and shake out the benzoic acid with two successive, 20-cc. portions of ether. A portion of 0.5 Gm. of the residue of benzoic acid remaining on the evaporation of the ether, meets the test for *chlorinated compounds* under *Acidum Benzoicum*, page 17.

Assay—Transfer about 1.5 Gm. of Sodium Benzoate, previously dried at 110° C. for 6 hours, and accurately weighed, to a tall beaker of about 300-cc. capacity, and add 75 cc. of ether and 5 drops of methyl orange T.S. Titrate the mixture with half-normal hydrochloric acid, mixing intimately the aqueous and ether layers by vigorous stirring, until a permanent orange color is produced in the aqueous layer. Each cc. of half-normal hydrochloric acid is equivalent to 0.07206 Gm. of $C_6H_5.COONa$.

Storage—Preserve Sodium Benzoate in well-closed containers.

SODII BICARBONAS

Sodium Bicarbonate

Sod. Bicarb.—Baking Soda

 $NaHCO_3$

Mol. wt. 84.02

Sodium Bicarbonate, when dried over sulfuric acid for 6 hours, contains not less than 99 per cent of $NaHCO_3$.

Description—Sodium Bicarbonate is a white, crystalline powder. It is stable in dry air, but slowly decomposes in moist air.

Solubility—One Gm. of Sodium Bicarbonate dissolves in 10 cc. of water at 25° C. It is insoluble in alcohol.

Identification—An aqueous solution of Sodium Bicarbonate responds to the tests for sodium, page 592, and for bicarbonate, page 588.

Insoluble substances—Dissolve 1 Gm. of Sodium Bicarbonate in 20 cc. of distilled water at 25° C.: it dissolves completely, producing a clear solution.

Reaction—An aqueous solution of Sodium Bicarbonate (1 in 20) when freshly prepared with cold distilled water, without shaking, is slightly alkaline to litmus paper. The alkalinity increases as the solution stands, is agitated or heated.

Carbonate—Dissolve 1 Gm. of Sodium Bicarbonate without agitation in 20 cc. of distilled water at a temperature not exceeding 15° C., and add 2 cc. of tenth-normal hydrochloric acid and 2 drops of phenolphthalein T.S.: the mixture does not immediately assume a red tint.

Ammonia—Heat Sodium Bicarbonate in a test tube: no odor of ammonia is evolved, and moist red litmus paper held at the mouth of the tube during the test is not colored blue.

Arsenic—An aqueous solution of Sodium Bicarbonate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Mix 2 Gm. of Sodium Bicarbonate with 5 cc. of distilled water and 9.5 cc. of diluted hydrochloric acid. Heat to boiling and maintain that temperature for 1 minute. Add 1 drop of phenolphthalein T.S. and then enough ammonia T.S. dropwise to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid and dilute with distilled water to 25 cc.: the heavy metals limit, page 586, for Sodium Bicarbonate is 5 parts per million.

Assay—Weigh accurately about 3 Gm. of Sodium Bicarbonate, previously dried over sulfuric acid for 6 hours, mix it with 25 cc. of distilled water, and titrate with normal sulfuric acid, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.08402 Gm. of NaHCO_3 .

Storage—Preserve Sodium Bicarbonate in well-closed containers.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SODII BIPHOSPHAS

Sodium Biphosphate

Sod. Biphos.—Sodium Dihydrogen Phosphate, Monosodium Orthophosphate,
Sodium Acid Phosphate

$\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$

Mol. wt. 138.01

Sodium Biphosphate, when dried to constant weight at 100° C., contains not less than 98 per cent of NaH_2PO_4 .

Description—Sodium Biphosphate occurs as colorless crystals or as a white, crystalline powder. It is odorless and is slightly deliquescent.

Solubility—Sodium Biphosphate is freely soluble in water but almost insoluble in alcohol.

Identification—An aqueous solution of Sodium Biphosphate (1 in 20) responds to the tests for sodium, page 592, and for phosphate, page 592.

Loss on drying—Dry about 2 Gm. of Sodium Biphosphate, accurately weighed, for 1 hour at 60° C., then raise the temperature to 100° C., and keep it at that temperature until it ceases to lose weight: the loss in weight is not less than 10 per cent and not more than 15 per cent.

Reaction—An aqueous solution of Sodium Biphosphate is acid to litmus paper and effervesces with sodium carbonate.

Free acid and disodium phosphate—Dissolve 2 Gm. of Sodium Biphosphate in 40 cc. of distilled water, and add 1 drop of methyl orange T.S.: if the solution is pink, it requires the addition of not more than 0.3 cc. of normal sodium hydroxide to

discharge its pink color; if the solution is yellow, it requires the addition of not more than 0.3 cc. of normal sulfuric acid to render it pink.

Chloride—One Gm. of Sodium Biphosphate shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 0.2-Gm. portion of Sodium Biphosphate shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Aluminum, calcium, etc.—An aqueous solution of Sodium Biphosphate (1 in 10) does not become turbid when rendered slightly alkaline to litmus paper with ammonia T.S.

Arsenic—An aqueous solution of Sodium Biphosphate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Dissolve 1 Gm. of Sodium Biphosphate in 20 cc. of distilled water, add 1 cc. of diluted hydrochloric acid, and dilute to 25 cc.: the heavy metals limit, page 586, for Sodium Biphosphate is 20 parts per million.

Assay—Weigh accurately about 2 Gm. of Sodium Biphosphate, previously dried to constant weight at 100° C., dissolve in 10 cc. of cold distilled water, add 20 cc. of a cold, saturated, aqueous solution of sodium chloride, and titrate the solution with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.1200 Gm. of NaH_2PO_4 .

Storage—Preserve Sodium Biphosphate in well-closed containers.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

SODII BORAS

Sodium Borate

Sod. Bor.—Borax, Sodium Tetraborate

$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

Mol. wt. 381.43

Sodium Borate contains not less than 52.32 per cent and not more than 54.92 per cent of $\text{Na}_2\text{B}_4\text{O}_7$, corresponding to not less than 99 per cent of $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$.

Description—Sodium Borate occurs as colorless, transparent crystals or as a white, crystalline powder. It is odorless. As Sodium Borate effloresces in warm, dry air, the crystals are often coated with white powder.

Solubility—One Gm. of Sodium Borate dissolves in 16 cc. of water and in about 1 cc. of glycerin, at 25° C. One Gm. dissolves in about 1 cc. of boiling water. It is insoluble in alcohol.

Identification—An aqueous solution of Sodium Borate (1 in 20) responds to the tests for sodium, page 592, and for borate, page 588.

Reaction—An aqueous solution of Sodium Borate (1 in 20) is alkaline to litmus paper and to phenolphthalein T.S.

Carbonate or bicarbonate—An aqueous solution of Sodium Borate (1 in 20) does not effervesce when treated with acids.

Arsenic—An aqueous solution of Sodium Borate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Dissolve 1 Gm. of Sodium Borate in 16 cc. of distilled water and 6 cc. of normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sodium Borate is 20 parts per million.

Assay—Dissolve about 2 Gm. of Sodium Borate, accurately weighed, in 50 cc. of distilled water. Titrate with half-normal hydrochloric acid, using methyl red T.S. as the indicator. Each cc. of half-normal hydrochloric acid is equivalent to 0.05032 Gm. of $\text{Na}_2\text{B}_4\text{O}_7$.

Storage—Preserve Sodium Borate in well-closed containers.

SODII BROMIDUM

Sodium Bromide

Sod. Bromid.

NaBr

Mol. wt. 102.91

Sodium Bromide, when dried at 110° C. for 6 hours, contains not less than 99 per cent of NaBr.

Description—Sodium Bromide occurs as white, odorless, cubical crystals, or as a white, granular powder. It absorbs moisture from the air without deliquescing.

Solubility—One Gm. of Sodium Bromide dissolves in 1.2 cc. of water and in 16 cc. of alcohol, at 25° C.

Identification—An aqueous solution of Sodium Bromide (1 in 10) responds to the tests for sodium, page 592, and for bromides, page 588.

Loss on drying—When dried for 6 hours at 110° C., Sodium Bromide loses not more than 1 per cent of its weight.

Alkalinity—Dissolve 1 Gm. of Sodium Bromide in 10 cc. of distilled water, add 0.1 cc. of tenth-normal sulfuric acid and 1 drop of phenolphthalein T.S., and heat to boiling: the solution remains colorless.

Bromate—Drop 1 cc. of diluted sulfuric acid on about 1 Gm. of powdered Sodium Bromide: the salt does not at once become yellow.

Iodide—Add a few drops of ferric chloride T.S. and 1 cc. of chloroform to 10 cc. of an aqueous solution of Sodium Bromide (1 in 20), and shake the mixture: the chloroform does not acquire a violet tint.

Sulfate—A solution of 2 Gm. of Sodium Bromide in 50 cc. of distilled water shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—An aqueous solution of Sodium Bromide meets the requirements of the test for *arsenic*, page 554.

Barium—A 10-cc. portion of an aqueous solution of Sodium Bromide (1 in 20), when acidulated with hydrochloric acid, is not rendered turbid by the addition of 1 cc. of potassium sulfate T.S.

Heavy metals—Dissolve 2 Gm. of Sodium Bromide in 10 cc. of distilled water, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sodium Bromide is 10 parts per million.

Assay—Weigh accurately 0.4 Gm. of Sodium Bromide, previously dried at 110° C. for 6 hours, and dissolve in about 50 cc. of distilled water. Add 50 cc. of tenth-normal silver nitrate, 2 cc. of ferric ammonium sulfate T.S., and 2 cc. of nitric acid. Titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01029 Gm. of NaBr. Each Gm. of Sodium Bromide, previously dried, is equivalent to not less than 96.2 cc. and not more than 97.9 cc. of tenth-normal silver nitrate.

Storage—Preserve Sodium Bromide in tight containers.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

SODII CACODYLAS

Sodium Cacodylate

Sod. Cacodyl.

 $\text{Na}(\text{CH}_3)_2\text{AsO}_2 \cdot 3\text{H}_2\text{O}$

Mol. wt. 214.02

Sodium Cacodylate contains not less than 72 per cent and not more than 75 per cent of $\text{Na}(\text{CH}_3)_2\text{AsO}_2$, the remainder consisting chiefly of water.

Description—Sodium Cacodylate occurs as white crystals, or as a white, granular powder. It is odorless and deliquescent.

Solubility—One Gm. of Sodium Cacodylate dissolves in about 0.5 cc. of water and in about 2.5 cc. of alcohol, at 25° C.

Melting temperature—Sodium Cacodylate liquefies in its water of hydration at about 60° C.

Identification—

A: Sodium Cacodylate burns with a bluish flame, emitting a garlic-like odor, and to a non-luminous flame it imparts an intensely yellow color.

B: A mixture of a few drops of an aqueous solution of Sodium Cacodylate (1 in 100) with 2 cc. of hypophosphorous acid T.S., allowed to stand in a stoppered tube, develops the odor of cacodyl within 1 hour.

Monomethylarsenate—No turbidity is produced in 10 cc. of an aqueous solution of Sodium Cacodylate (1 in 20) by 1 cc. of calcium chloride T.S., either in the cold or on heating.

Arsenate or phosphate—Add 2 cc. of magnesia mixture T.S. to 5 cc. of an aqueous solution of Sodium Cacodylate (1 in 20): the mixture develops no turbidity within 1 hour.

Chloride—One Gm. of Sodium Cacodylate shows no more *chloride* than corresponds to 0.3 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Add 5 drops of barium chloride T.S. to 10 cc. of an aqueous solution of Sodium Cacodylate (1 in 50), acidulated with 2 drops of hydrochloric acid: the mixture develops no turbidity within 30 seconds.

Alkalinity or acidity—A solution of 2 Gm. of Sodium Cacodylate in 50 cc. of recently boiled distilled water requires not more than 0.5 cc. of tenth-normal hydrochloric acid or 0.5 cc. of tenth-normal sodium hydroxide to render it neutral, using 2 drops of phenolphthalein T.S. as the indicator.

Assay—Place about 0.2 Gm. of Sodium Cacodylate, accurately weighed, in a 500-cc. Kjeldahl flask, and add 10 Gm. of potassium sulfate, 0.3 Gm. of starch, and 20 cc. of sulfuric acid. Digest over a low flame until frothing has ceased and the solution is colorless, then cool, and dilute the solution cautiously with 75 cc. of distilled water. Transfer the solution to a 500-cc. Erlenmeyer flask, rinsing the Kjeldahl flask with 50 cc. of distilled water added in small portions. Slowly add a cold aqueous solution of sodium hydroxide (1 in 2) until the mixture is alkaline to litmus paper, then add diluted sulfuric acid until the reaction is faintly acid to litmus paper. Again cool the solution, add 2 Gm. of sodium bicarbonate, stir until dissolved, add a few drops of starch T.S., and immediately titrate with tenth-normal iodine. Each cc. of tenth-normal iodine is equivalent to 0.007999 Gm. of $\text{Na}(\text{CH}_3)_2\text{AsO}_2$.

Storage—Preserve Sodium Cacodylate in tight containers.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

SODII CARBONAS MONOHYDRATUS

Monohydrated Sodium Carbonate

Sod. Carb. Monohyd.

$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$

Mol. wt. 124.02

Monohydrated Sodium Carbonate, when dried to constant weight at 110° C., contains not less than 99.5 per cent of Na_2CO_3 .

Description—Monohydrated Sodium Carbonate occurs as colorless crystals or as a white, crystalline powder. When exposed to air, under ordinary conditions, it absorbs only a slight percentage of moisture. When exposed to warm, dry air at or above 50° C., the salt effloresces, and at 100° C. becomes anhydrous.

Solubility—One Gm. of Monohydrated Sodium Carbonate dissolves in 3 cc. of water at 25° C. and in 1.8 cc. of boiling water.

Identification—

A: An aqueous solution of Monohydrated Sodium Carbonate (1 in 10) is strongly alkaline to litmus paper and to phenolphthalein T.S.

B: Monohydrated Sodium Carbonate responds to the tests for sodium, page 592, and for carbonate, page 588.

Loss on drying—Weigh accurately about 2 Gm. of Monohydrated Sodium Carbonate, and dry it to constant weight at 110° C.: its loss in weight is not less than 10 per cent and not more than 15 per cent.

Heavy metals—Dissolve 1 Gm. of Monohydrated Sodium Carbonate in 10 cc. of distilled water, add 7.5 cc. of diluted hydrochloric acid, and heat to boiling. Add 1 drop of phenolphthalein T.S., and then sufficient sodium hydroxide T.S. to give the solution a faint pink color. Cool to room temperature, add 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Monohydrated Sodium Carbonate is 20 parts per million.

Assay—Transfer the anhydrous sodium carbonate obtained in the test for *loss on drying* to a flask with the aid of 50 cc. of distilled water, and titrate with normal sulfuric acid, methyl orange T.S. being used as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.05300 Gm. of Na_2CO_3 .

Storage—Preserve Monohydrated Sodium Carbonate in well-closed containers.

AVERAGE DOSE—Metric, 0.25 Gm.—Apothecaries, 4 grains.

SODII CHLORIDUM

Sodium Chloride

Sod. Chlorid.

NaCl

Mol. wt. 58.45

Sodium Chloride, when dried at 110° C. for 2 hours, contains not less than 99.5 per cent of NaCl.

Description—Sodium Chloride occurs as colorless, cubical crystals or as a white, crystalline powder.

Solubility—One Gm. of Sodium Chloride dissolves in 2.8 cc. of water, and in about 10 cc. of glycerin, at 25° C. One Gm. dissolves in 2.7 cc. of boiling water. It is slightly soluble in alcohol.

Identification—An aqueous solution of Sodium Chloride (1 in 20) responds to the tests for sodium, page 592, and for chloride, page 589.

Reaction—Dissolve 5 Gm. of Sodium Chloride in 50 cc. of freshly boiled and cooled distilled water and add 2 drops of bromothymol blue pH indicator. If the solution is yellow, it requires not more than 0.1 cc. of fiftieth-normal sodium hydroxide to produce a blue color. If the solution is blue or green, it requires not more than 0.2 cc. of fiftieth-normal hydrochloric acid to produce a yellow color.

Iodide or bromide—Digest 2 Gm. of finely powdered Sodium Chloride for 3 hours with 25 cc. of warm alcohol, cool the mixture, and remove the undissolved salt by filtration. Evaporate the filtrate to dryness, dissolve the residue in 5 cc. of distilled water, add 1 cc. of chloroform, and cautiously introduce, drop by drop, with constant agitation, chlorine T.S. which has been diluted with twice its volume of distilled water: the chloroform does not acquire a violet, yellow, or orange color.

Barium—Dissolve 4 Gm. of Sodium Chloride in 20 cc. of distilled water, filter if necessary, and divide the solution into two portions. To one portion add 2 cc. of diluted sulfuric acid and to the other 2 cc. of distilled water: after standing for 2 hours the solutions are equally clear.

Calcium and magnesium—Mix 2 cc. of ammonia T.S. with 20 cc. of an aqueous solution of Sodium Chloride (1 in 100), and divide the mixture into two portions. Treat one portion with ammonium oxalate T.S. and the other portion with sodium phosphate T.S.: neither mixture becomes turbid within 5 minutes.

Arsenic—A 5-cc. portion of an aqueous solution of Sodium Chloride (1 in 10) meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfuric and sulfurous acids.

Heavy metals—Dissolve 2 Gm. of Sodium Chloride in 23 cc. of distilled water and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Sodium Chloride is 5 parts per million.

Assay—Weigh accurately about 0.25 Gm. of Sodium Chloride, previously dried at 110° C. for 2 hours, and dissolve it in 50 cc. of distilled water in a 200-cc. volumetric flask. Add 50 cc. of tenth-normal silver nitrate to the solution, then 5 cc. of nitric acid, and sufficient distilled water to make the mixture measure 200 cc. Mix well, filter into a dry flask through a dry filter, and reject the first 20 cc. of filtrate. To exactly 100 cc. of the subsequent filtrate add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.005845 Gm. of NaCl.

Storage—Preserve Sodium Chloride in well-closed containers.

U. S. P. Products of Sodium Chloride—Injectio Dextrosi et Sodii Chloridi, Liquor Chloridum Trium Isotonicus, Liquor Sodii Chloridi Isotonicus.

SODII CITRAS

Sodium Citrate

Sod. Cit.



Mol. wt. 294.12

Sodium Citrate, when dried to constant weight at 150° C., contains not less than 99 per cent of $\text{C}_3\text{H}_4\text{OH}(\text{COONa})_3$.

Description—Sodium Citrate occurs as colorless crystals, or as a white, crystalline powder. It has a cooling, saline taste.

Solubility—One Gm. of Sodium Citrate dissolves in 1.5 cc. of water at 25° C. and in 0.6 cc. of boiling water. It is insoluble in alcohol.

Identification—

A: An aqueous solution of Sodium Citrate (1 in 20) responds to the tests for sodium, page 592, and for citrate, page 589.

B: Upon ignition, Sodium Citrate yields an alkaline residue which effervesces when treated with acids, and imparts a yellow color to a non-luminous flame.

Loss on drying—Weigh accurately about 2.5 Gm. of Sodium Citrate, and dry it to constant weight at 150° C.: the loss in weight is not less than 10 per cent and not more than 13 per cent.

Reaction—An aqueous solution of Sodium Citrate (1 in 20) is slightly alkaline to litmus paper, but the color of a 10-cc. portion of the solution is not affected by the addition of 1 drop of phenolphthalein T.S.

Tartrate—To a solution of 1 Gm. of Sodium Citrate in 2 cc. of distilled water, add 1

cc. of potassium acetate T.S. and 1 cc. of acetic acid: no crystalline precipitate forms in the mixture after scratching the sides of the tube with a glass rod.

Arsenic—An aqueous solution of Sodium Citrate meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 2 Gm. of Sodium Citrate in 10 cc. of distilled water, add 7 cc. of diluted hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sodium Citrate is 10 parts per million.

Assay—Weigh accurately about 2 Gm. of dried Sodium Citrate obtained in the determination of *Loss on drying*, and proceed as directed under *Alkali Salts of Organic Acids*, page 553. Each cc. of half-normal sulfuric acid is equivalent to 0.04301 Gm. of $C_3H_4.OH.(COONa)_3$.

Storage—Preserve Sodium Citrate in tight containers.

U. S. P. Product of Sodium Citrate—Liquor Sodii Citratis Anticoagulans.

AVERAGE DOSE—Metric, 1 Gm.—Apothecaries, 15 grains.

SODII HYDROXIDUM

Sodium Hydroxide

Sod. Hydrox.—Caustic Soda

NaOH

Mol. wt. 40.01

Sodium Hydroxide contains not less than 95 per cent of total alkali calculated as NaOH, of which not more than 3 per cent is Na_2CO_3 .

Caution—Great care is necessary in handling Sodium Hydroxide, as it rapidly destroys organic tissues.

Description—Sodium Hydroxide occurs in white, or nearly white, fused masses, in small pellets, in flakes, in sticks, and in other forms. It is hard and brittle and shows a crystalline fracture. Exposed to the air, Sodium Hydroxide rapidly absorbs carbon dioxide and moisture.

Solubility—One Gm. of Sodium Hydroxide dissolves in 1 cc. of water at 25° C. It is freely soluble in alcohol.

Identification—An aqueous solution of Sodium Hydroxide (1 in 25) responds to the tests for sodium, page 592.

Reaction—A solution of Sodium Hydroxide even when greatly diluted is strongly alkaline to litmus paper.

Heavy metals—Dissolve 1 Gm. of Sodium Hydroxide in 5 cc. of distilled water and 11 cc. of diluted hydrochloric acid. Heat to boiling, add 1 drop of phenolphthalein T.S., and then sufficient ammonia T.S. dropwise to give the solution a faint pink color. Add 2 cc. of diluted acetic acid and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sodium Hydroxide is 30 parts per million.

Potassium—An aqueous solution of Sodium Hydroxide (1 in 20), acidified with acetic acid, yields no precipitate on the addition of a few drops of sodium cobaltinitrite T.S.

Insoluble substances and organic matter—An aqueous solution of Sodium Hydroxide (1 in 20) is complete, clear, and colorless.

Assay—Dissolve about 1.5 Gm. of Sodium Hydroxide, accurately weighed, in about 40 cc. of recently boiled and cooled distilled water. Cool the solution to 15° C., and titrate with normal sulfuric acid, using phenolphthalein T.S. as the indicator.

At the discharge of the pink color of the indicator, record the volume of acid solution required, add 3 drops of methyl orange T.S., and continue the titration to the production of a persistent pink color. Each cc. of normal sulfuric acid consumed is equivalent to 0.04001 Gm. of NaOH. Each cc. difference between the number of cc. of normal sulfuric acid consumed in the methyl orange and phenolphthalein titrations is equivalent to 0.1060 Gm. of Na_2CO_3 .

Storage—Preserve Sodium Hydroxide in tight containers.

SODII IODIDUM

Sodium Iodide

Sod. Iodid.

NaI

Mol. wt. 149.92

Sodium Iodide, when dried to constant weight at 120°C ., contains not less than 99 per cent of NaI.

Description—Sodium Iodide occurs as colorless, odorless crystals, or as a white, crystalline powder. In moist air Sodium Iodide cakes and then deliquesces, and frequently undergoes decomposition, developing a brown tint.

Solubility—One Gm. of Sodium Iodide dissolves in 0.6 cc. of water, in about 2 cc. of alcohol, and in about 1 cc. of glycerin, at 25°C .

Identification—An aqueous solution of Sodium Iodide (1 in 20) responds to the tests for sodium, page 592, and for iodide, page 590.

Loss on drying—Dry Sodium Iodide to constant weight at 120°C .: the loss in weight does not exceed 5 per cent.

Iodate, nitrite, thiosulfate, and barium—Dissolve 0.5 Gm. of Sodium Iodide in 10 cc. of distilled water which has been previously boiled and cooled, and add 2 drops of diluted sulfuric acid: no distinct yellow color appears within 30 seconds, and no turbidity develops in 1 minute.

Nitrate, nitrite, and ammonia—Add 5 cc. of sodium hydroxide T.S. and about 0.2 Gm. of aluminum wire to a solution of 1 Gm. of Sodium Iodide in 5 cc. of distilled water, contained in a test tube of about 40-cc. capacity. Insert a pledget of purified cotton in the upper portion of the test tube, and place a piece of moistened red litmus paper over the mouth of the tube. Heat the test tube and its contents on a water bath for 15 minutes: no blue coloration of the paper is discernible.

Alkalinity—Dissolve 1 Gm. of Sodium Iodide in 10 cc. of distilled water, and add 0.15 cc. of tenth-normal sulfuric acid: no red color is produced by the addition of 1 drop of phenolphthalein T.S.

Heavy metals—Dissolve 2 Gm. of Sodium Iodide in 23 cc. of distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Sodium Iodide is 10 parts per million.

Potassium—A solution of 1 Gm. of Sodium Iodide in 2 cc. of distilled water yields no precipitate with 1 cc. of sodium bitartrate T.S.

Assay—Dry about 0.5 Gm. of Sodium Iodide to constant weight at 120°C ., weigh accurately, dissolve it in about 10 cc. of distilled water, add 35 cc. of hydrochloric acid and 5 cc. of chloroform, and titrate the mixture with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. The last portions of the iodate solution must be added in drops, the mixture being agitated vigorously. After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, the mixture should be titrated further with the iodate solution. Each cc. of twentieth-molar potassium iodate is equivalent to 0.01499 Gm. of NaI.

Storage—Preserve Sodium Iodide in tight containers.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

SODII NITRIS

Sodium Nitrite

Sod. Nitris

NaNO_2

Mol. wt. 69.01

Sodium Nitrite, when dried over sulfuric acid for 18 hours, contains not less than 97 per cent of NaNO_2 .

Description—Sodium Nitrite occurs as a white to slightly yellow, granular powder, or as white or nearly white, opaque, fused masses or sticks. It has a mild, saline taste and is deliquescent in air.

Solubility—One Gm. of Sodium Nitrite dissolves in 1.5 cc. of water at 25° C. It is sparingly soluble in alcohol.

Identification—An aqueous solution of Sodium Nitrite responds to the tests for sodium, page 592, and for nitrite, page 591.

Loss on drying—When dried over sulfuric acid for 18 hours, Sodium Nitrite loses not more than 1 per cent of its weight.

Reaction—An aqueous solution of Sodium Nitrite (1 in 20) is slightly alkaline to litmus paper.

Heavy metals—Dissolve 1 Gm. of Sodium Nitrite in 6 cc. of diluted hydrochloric acid, and evaporate to dryness on a water bath. Reduce the residue to a coarse powder, and continue heating on the water bath until the odor of hydrochloric acid is no longer perceptible. Dissolve the residue in 23 cc. of distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Sodium Nitrite is 20 parts per million.

Assay—Weigh accurately about 1 Gm. of Sodium Nitrite previously dried over sulfuric acid for 18 hours, and dissolve it in sufficient distilled water to make exactly 100 cc. Add exactly 10 cc. of this solution, from a pipette, to a mixture of 50 cc. of tenth-normal potassium permanganate, 100 cc. of distilled water, and 5 cc. of sulfuric acid. When adding the Sodium Nitrite solution, immerse the tip of the pipette beneath the surface of the permanganate mixture. Warm the liquid to 40° C., allow it to stand for 5 minutes, and add 25 cc. of tenth-normal oxalic acid. Heat the mixture to about 80° C., and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.003450 Gm. of NaNO_2 .

Storage—Preserve Sodium Nitrite in tight containers.

U. S. P. Product of Sodium Nitrite—Tabellæ Sodii Nitritis.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

SODII PERBORAS

Sodium Perborate

Sod. Perbor.

$\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$

Mol. wt. 153.88

Sodium Perborate contains not less than 9 per cent of available oxygen, corresponding to about 86.5 per cent of $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$.

Description—Sodium Perborate occurs as white, crystalline granules or as a white powder. It is odorless, and has a saline taste. It is stable in cool and dry air, but is decomposed with the evolution of oxygen in warm or in moist air. In aqueous

solution Sodium Perborate decomposes into sodium metaborate and hydrogen peroxide, the solution gradually evolving oxygen. Oxygen is evolved more rapidly if the solution is warmed.

Solubility—One Gm. of Sodium Perborate is soluble in about 40 cc. of water at 25° C.

Identification—

A: A saturated aqueous solution of Sodium Perborate is alkaline to phenolphthalein T.S., and when acidified with hydrochloric acid, responds to the identification tests for sodium, page 592, and for borate, page 588.

B: Agitate a mixture of 1 cc. of an aqueous solution of Sodium Perborate (1 in 50), 1 cc. of diluted sulfuric acid, a few drops of potassium dichromate T.S., and 2 cc. of ether: the ether acquires a blue color.

Heavy metals—Dissolve 1 Gm. of Sodium Perborate in 10 cc. of distilled water and 2.5 cc. of diluted hydrochloric acid. Evaporate to dryness on a water bath, with frequent stirring. Dissolve the residue in 23 cc. of distilled water, and add 2 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 586, for Sodium Perborate is 20 parts per million.

Assay—Dissolve about 0.25 Gm. of Sodium Perborate, accurately weighed, in a mixture of 50 cc. of distilled water and 10 cc. of diluted sulfuric acid, and titrate the solution with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.0008 Gm. of available oxygen.

Storage—Preserve Sodium Perborate in tight containers, preferably at a temperature not above 30° C.

SODII PHOSPHAS

Sodium Phosphate

Sod. Phos.

$\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O}$

Mol. wt. 268.09

Sodium Phosphate, when dried to constant weight at 110° C., contains not less than 98 per cent of Na_2HPO_4 .

Description—Sodium Phosphate occurs as a colorless or white, granular salt. It effloresces in warm, dry air.

Solubility—One Gm. of Sodium Phosphate dissolves in 4 cc. of water at 25° C. It is very slightly soluble in alcohol.

Identification—An aqueous solution of Sodium Phosphate (1 in 20) responds to the tests for sodium, page 592, and for phosphate, page 592.

Loss on drying—Dry Sodium Phosphate to constant weight at 110° C.: the loss in weight is not less than 43 per cent and not more than 50 per cent.

Insoluble substances—Dissolve 10 Gm. of Sodium Phosphate in 100 cc. of distilled water, filter through a tared filtering crucible, wash the insoluble residue with hot distilled water, and dry to constant weight at 110° C.: the residue does not exceed 20 mg.

Reaction—An aqueous solution of Sodium Phosphate (1 in 10) is alkaline to phenolphthalein T.S.

Chloride—One Gm. of Sodium Phosphate shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 0.2-Gm. portion of Sodium Phosphate shows no more *sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 626.

Arsenic—An aqueous solution of Sodium Phosphate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Dissolve 2 Gm. of Sodium Phosphate in 10 cc. of distilled water, add 4 cc. of diluted hydrochloric acid, and dilute to 25 cc.: the heavy metals limit, page 586, for Sodium Phosphate is 10 parts per million.

Assay—Weigh accurately about 0.3 Gm. of Sodium Phosphate previously dried to constant weight at 110° C., dissolve it in about 100 cc. of distilled water in a beaker of about 300-cc. capacity. Add to the solution 1 cc. of hydrochloric acid, then add an excess (20 cc.) of magnesia mixture T.S. and 40 cc. of stronger ammonia T.S. Mix well, and set it aside for 4 hours. Collect the precipitate in a tared, previously ignited filtering crucible, and wash it with a mixture of 1 volume of ammonia T.S. and 3 volumes of distilled water, until free from chloride. Dry, and ignite the precipitate to constant weight. The weight of the magnesium pyrophosphate obtained, multiplied by 1.276, indicates its equivalent in Na_2HPO_4 .

Storage—Preserve Sodium Phosphate in tight containers.

U. S. P. Products of Sodium Phosphate—Sodii Phosphas Effervescens, Sodii Phosphas Exsiccatus.

AVERAGE DOSE—Metric, 4 Gm.—Apothecaries, 1 drachm.

SODII PHOSPHAS EFFERVESCENS

Effervescent Sodium Phosphate

Sod. Phos. Eff.

EXSICCATED SODIUM PHOSPHATE, dried and powdered..	200 Gm.
SODIUM BICARBONATE, in dry powder.....	477 Gm.
TARTARIC ACID, in dry powder.....	252 Gm.
CITRIC ACID, uneffloresced crystals.....	162 Gm.
To make about.....	1000 Gm.

Powder the citric acid, mix it intimately with the exsiccated sodium phosphate and tartaric acid, and thoroughly incorporate the sodium bicarbonate.

Place the mixed powders on a plate of glass or in a suitable dish in an oven previously heated to between 93° and 104° C. Manipulate the mixture carefully with a spatula which is acid-resistant, and when it has become moist rub it through a No. 6 tinned-iron sieve. Dry the granules at a temperature not exceeding 54° C., and immediately transfer the salt to suitable containers and seal them tightly.

NOTE—The proportions of tartaric acid and citric acid may be varied if desired, but their combined acidity must be equivalent to the acidity indicated in the official formula and the percentage of exsiccated sodium phosphate must be maintained.

Storage—Preserve Effervescent Sodium Phosphate in tight containers.

AVERAGE DOSE—Metric, 10 Gm.—Apothecaries, 2½ drachms.

SODII PHOSPHAS EXSICCATUS

Exsiccated Sodium Phosphate

Sod. Phos. Exsic.—Dried Sodium Phosphate



Mol. wt. 141.98

Exsiccated Sodium Phosphate, when dried to constant weight at 110° C., contains not less than 98 per cent of Na_2HPO_4 .

Description—Exsiccated Sodium Phosphate is a white powder which readily absorbs moisture.

Solubility—One Gm. of Exsiccated Sodium Phosphate dissolves in 8 cc. of water at 25° C. It is insoluble in alcohol.

Identification—An aqueous solution of Exsiccated Sodium Phosphate (1 in 30) responds to the tests for sodium, page 592, and for phosphate, page 592.

Loss on drying—Dry Exsiccated Sodium Phosphate to constant weight at 110° C.: its loss in weight does not exceed 5 per cent.

Other tests—Proper allowance being made for its loss of water of hydration, Exsiccated Sodium Phosphate meets the requirements of the tests for *chloride, sulfate, insoluble substances, arsenic, and heavy metals*, under *Sodii Phosphas*, page 418.

Assay—Proceed as directed under *Sodii Phosphas*, using about 0.2 Gm. of Exsiccated Sodium Phosphate, previously dried to constant weight at 110° C. and accurately weighed. The weight of magnesium pyrophosphate obtained, multiplied by 1.276 indicates its equivalent in Na_2HPO_4 .

Storage—Preserve Exsiccated Sodium Phosphate in tight containers.

U. S. P. Product of Exsiccated Sodium Phosphate—*Sodii Phosphas Effervescens*.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SODII SALICYLAS

Sodium Salicylate

Sod. Salicyl.



Mol. wt. 160.11

Sodium Salicylate, when dried at 110° C. for 4 hours, contains not less than 99.5 per cent of $\text{C}_6\text{H}_4\text{OH.COONa}$.

Description—Sodium Salicylate occurs as a white, microcrystalline powder, as scales, or as an amorphous powder. It is colorless or has not more than a faint, pink tinge. It is odorless, or has a faint, characteristic odor, and a sweet, saline taste. It is affected by light.

Solubility—One Gm. of Sodium Salicylate dissolves in 1 cc. of water and in 10 cc. of alcohol and in about 4 cc. of glycerin, at 25° C. It is very soluble in boiling water and in boiling alcohol.

Identification—An aqueous solution of Sodium Salicylate (1 in 20) responds to the tests for sodium, page 592, and for salicylate, page 592.

Loss on drying—When dried for 4 hours at 110° C., Sodium Salicylate loses not more than 0.5 per cent of its weight.

Reaction—An aqueous solution of Sodium Salicylate (1 in 10) when freshly made is colorless or nearly colorless, and is neutral or slightly acid to litmus paper.

Sulfite or thiosulfate—Add 1 cc. of hydrochloric acid to a solution of 1 Gm. of Sodium Salicylate in 20 cc. of distilled water, and filter the liquid: not more than 0.15 cc. of tenth-normal iodine is required to produce a yellow color in the filtrate.

Heavy metals—Dissolve 1 Gm. of Sodium Salicylate in 20 cc. of distilled water. Add, with constant stirring, 2 cc. of diluted hydrochloric acid, filter, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sodium Salicylate is 20 parts per million.

Assay—Weigh accurately about 2 Gm. of Sodium Salicylate, previously dried at 110° C. for 4 hours and transfer it to a tall beaker of about 300-cc. capacity. Add 75 cc. of ether and 10 drops of bromophenol blue T.S. and titrate with half-normal hydrochloric acid, mixing the aqueous and ether layers intimately by vigorous stirring until a permanent, pale green color is produced in the aqueous layer. Transfer the contents of the beaker to a small separator, and draw off the aqueous layer into a small flask. Wash the ethereal layer once with 5 cc. of distilled water, and add this to the aqueous layer. Add 20 cc. of ether to the combined aqueous solutions, and mix intimately. Continue the titration with vigorous shaking until a permanent, pale green color is produced in the aqueous layer. Each cc. of half-normal hydrochloric acid is equivalent to 0.08005 Gm. of $C_6H_4.OH.COONa$.

Storage—Preserve Sodium Salicylate in well-closed, light-resistant containers.

U. S. P. Product of Sodium Salicylate—*Tabellæ Sodii Salicylatis*.

AVERAGE DOSE—Metric, 0.3 Gm.—Apothecaries, 5 grains.

SODII STEARAS

Sodium Stearate

Sod. Stear.

A mixture of varying proportions of sodium stearate ($NaC_{18}H_{35}O_2$) and sodium palmitate ($NaC_{16}H_{31}O_2$).

Description—Sodium Stearate is a fine, white powder, soapy to the touch, usually having a slight tallow-like odor. It is affected by light.

Solubility—Sodium Stearate dissolves slowly in cold water or in alcohol, but is readily soluble in these solvents when hot.

Identification—

A: When heated, Sodium Stearate fuses. At a higher temperature it decomposes, giving off inflammable vapors and the odor of burning fat, finally leaving a residue which, when moistened with distilled water, is alkaline to litmus paper, effervesces with acids, and colors a non-luminous flame intensely yellow.

B: Dissolve 50 Gm. of Sodium Stearate in 500 cc. of hot distilled water, add 50 cc. of dilute sulfuric acid (made by adding 1 volume of sulfuric acid to 3 volumes of distilled water), and heat the solution with frequent stirring until the fatty acids separate cleanly as a transparent layer. Wash the acids with boiling distilled water until free from sulfuric acid, collect them in a small beaker, and place on a water bath or steam bath until the water has settled and the fatty acids are clear. Allow the acids to cool, melt, and filter them into a dry beaker while hot, and dry for 20 minutes at 100° C.: the solidification temperature of the fatty acids is not less than 54° C., page 579.

Loss on drying—Tare a beaker containing 1 Gm. of clean sand, which has been previously dried at 110° C., add about 0.5 Gm. of Sodium Stearate, and reweigh. Add 10 cc. of alcohol, evaporate the mixture to dryness at about 80° C., and dry to constant weight at 110° C.: the loss in weight does not exceed 5 per cent.

Alcohol-insoluble substances—Boil 1 Gm. of Sodium Stearate with 25 cc. of alcohol under a reflux condenser: it dissolves completely and the resulting solution is clear or not more than slightly opalescent.

Reaction—An aqueous solution of Sodium Stearate is alkaline to phenolphthalein T.S.

Free alkali and free acids—Weigh accurately 2 Gm. of Sodium Stearate, dissolve it in 50 cc. of neutral alcohol with the aid of a little heat, cool, and add 3 drops of phenolphthalein T.S.; no pink color is produced. Titrate the solution with tenth-normal sodium hydroxide until a pink color is produced: not less than 0.60 cc. and not more than 0.85 cc. of tenth-normal sodium hydroxide is required.

Storage—Preserve Sodium Stearate in well-closed containers.

SODII SULFAS

Sodium Sulfate

Sod. Sulf.—Glauber's Salt

$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$

Mol. wt. 322.21

Sodium Sulfate, when dried to constant weight at 110°C ., contains not less than 99 per cent of Na_2SO_4 .

Description—Sodium Sulfate occurs as large, colorless, odorless, transparent crystals or as a granular powder. It effloresces rapidly in air. Sodium Sulfate liquefies in its water of hydration at about 33°C . At 100°C . it loses all of its water of hydration.

Solubility—One Gm. of Sodium Sulfate dissolves in 1.5 cc. of water at 25°C . It is insoluble in alcohol but soluble in glycerin.

Identification—An aqueous solution of Sodium Sulfate (1 in 20) responds to the tests for sodium, page 592, and for sulfate, page 592.

Loss on drying—Weigh accurately about 1 Gm. of Sodium Sulfate, and dry it to constant weight at 110°C .: the loss in weight is not less than 51 per cent and not more than 57 per cent.

Reaction—An aqueous solution of Sodium Sulfate (1 in 10) is neutral to litmus paper.

Arsenic—An aqueous solution of Sodium Sulfate meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 2 Gm. of Sodium Sulfate in 10 cc. of distilled water, add 2 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sodium Sulfate is 10 parts per million.

Assay—Weigh accurately about 0.4 Gm. of the dried Sodium Sulfate obtained in the test for loss on drying, dissolve it in 200 cc. of distilled water, and add 1 cc. of hydrochloric acid. Heat to boiling, and gradually add an excess of hot barium chloride T.S. Heat the mixture for 1 hour on a water bath, collect the precipitate of barium sulfate on a filter, wash it until free from chloride, dry, ignite, and weigh. The weight of the barium sulfate thus obtained, multiplied by 0.6086, indicates its equivalent of Na_2SO_4 .

Storage—Preserve Sodium Sulfate in tight containers, preferably at a temperature not above 30°C .

AVERAGE DOSE—Metric, 15 Gm.—Apothecaries, 4 drachms.

SODII SULFIS EXSICCATUS

Exsiccated Sodium Sulfite

Sod. Sulfis Exsicc.

Na_2SO_3

Mol. wt. 126.05

Exsiccated Sodium Sulfite contains not less than 95 per cent of Na_2SO_3 .

Description—Exsiccated Sodium Sulfite occurs as a white, odorless powder, and possesses a cooling, saline, sulfurous taste. It undergoes oxidation in air.

Solubility—One Gm. of Exsiccated Sodium Sulfite is soluble in about 4 cc. of water at 25° C. It is sparingly soluble in alcohol.

Identification—An aqueous solution of Exsiccated Sodium Sulfite (1 in 20) responds to the tests for sodium, page 592, and for sulfite, page 592.

Reaction—An aqueous solution of Exsiccated Sodium Sulfite (1 in 10) is alkaline to litmus paper and to phenolphthalein T.S.

Thiosulfate—Dissolve 1 Gm. of Exsiccated Sodium Sulfite in 15 cc. of distilled water, and slowly add 5 cc. of hydrochloric acid: no turbidity is produced within 5 minutes.

Arsenic—Dissolve 0.2 Gm. of Exsiccated Sodium Sulfite in 5 cc. of distilled water, and add 1 cc. of nitric acid gradually. Then add 1 cc. of sulfuric acid, and evaporate until strong fumes of sulfur trioxide are evolved. Cool cautiously, and add 10 cc. of distilled water: the resulting solution meets the requirements of the test for *arsenic*, page 554.

Heavy metals—Dissolve 1 Gm. of Exsiccated Sodium Sulfite in 5 cc. of distilled water, add 2 cc. of hydrochloric acid, and evaporate to dryness on a water bath. Add 3 cc. of hot distilled water to the residue, and 1 cc. of hydrochloric acid, and evaporate again to complete dryness on a water bath. Dissolve the residue in 23 cc. of distilled water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 586, for Exsiccated Sodium Sulfite is 20 parts per million.

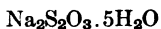
Assay—Accurately weigh about 0.25 Gm. of Exsiccated Sodium Sulfite, and add it to 50 cc. of tenth-normal iodine. After standing 5 minutes, add 1 cc. of hydrochloric acid, and titrate the excess of iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.006303 Gm. of Na_2SO_3 .

Storage—Preserve Exsiccated Sodium Sulfite in well-closed containers.

SODII THIOSULFAS

Sodium Thiosulfate

Sod. Thiosulf.—“Sodium Hyposulfite”



Mol. wt. 248.19

Sodium Thiosulfate, when dried to constant weight at 100° C., contains not less than 99 per cent of $\text{Na}_2\text{S}_2\text{O}_3$.

Description—Sodium Thiosulfate occurs as large, colorless crystals or as a coarse, crystalline powder. It is deliquescent in moist air and effloresces in dry air at a temperature above 33° C.

Solubility—One Gm. of Sodium Thiosulfate dissolves in 0.5 cc. of water at 25° C. It is insoluble in alcohol.

Identification—

A: An aqueous solution of Sodium Thiosulfate responds to the tests for sodium, page 592, and for thiosulfate, page 593.

B: An aqueous solution of Sodium Thiosulfate discharges the color of solutions of iodine and of iodized starch.

C: The addition of hydrochloric acid to an aqueous solution of Sodium Thiosulfate (1 in 10) produces a white precipitate.

Loss on drying—Weigh accurately about 1 Gm. of Sodium Thiosulfate, dry first at from 40° C. to 50° C., then to constant weight at 100° C.: the loss in weight is not less than 32 per cent and not more than 37 per cent.

Reaction—An aqueous solution of Sodium Thiosulfate (1 in 10) is neutral or faintly alkaline to litmus paper.

Arsenic—Add 3 cc. of nitric acid to 5 cc. of an aqueous solution of Sodium Thiosulfate (1 in 25), evaporate the solution cautiously to dryness on a water bath, treat the residue with a few cc. of distilled water, filter the liquid, and evaporate the filtrate and washings to dryness: the residue meets the requirements of the test for *arsenic*, page 554.

Calcium—An aqueous solution of Sodium Thiosulfate (1 in 20) is not rendered turbid by the addition of ammonium oxalate T.S.

Heavy metals—Dissolve 1 Gm. of Sodium Thiosulfate in 10 cc. of distilled water. Add 5 cc. of diluted hydrochloric acid slowly, and evaporate the mixture to dryness on a steam bath. Gently boil the residue with 15 cc. of distilled water for 2 minutes, and filter. Heat the filtrate to boiling, and add sufficient bromine T.S. to the hot filtrate to produce a clear solution and provide a slight excess of bromine. Boil the solution to expel the bromine completely, cool to room temperature, then add a drop of phenolphthalein T.S. and follow with sodium hydroxide T.S. until a slight pink color is produced. Add 2 cc. of diluted acetic acid and dilute with distilled water to 25 cc.: the heavy metals limit, page 586, for Sodium Thiosulfate is 20 parts per million.

Assay—Weigh accurately about 0.5 Gm. of the dried Sodium Thiosulfate obtained in the test for *loss on drying*, dissolve it in 30 cc. of distilled water, and titrate with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.01581 Gm. of $\text{Na}_2\text{S}_2\text{O}_3$.

Storage—Preserve Sodium Thiosulfate in tight, light-resistant containers.

AVERAGE DOSE—Oral or intravenous, Metric, 1 Gm.—Apothecaries, 15 grains.

SPIRITUS AMMONIÆ AROMATICUS

Aromatic Spirit of Ammonia

Sp. Ammon. Arom.

Aromatic Spirit of Ammonia contains, in each 100 cc., not less than 1.7 Gm. and not more than 2.1 Gm. of total NH_3 ; and ammonium carbonate, corresponding to not less than 3.5 Gm. and not more than 4.5 Gm. of $(\text{NH}_4)_2\text{CO}_3$.

AMMONIUM CARBONATE, in translucent pieces.....	34 Gm.
DILUTED SOLUTION OF AMMONIA.....	90 cc.
OIL OF LEMON.....	10 cc.
OIL OF LAVENDER.....	1 cc.
OIL OF MYRISTICA.....	1 cc.
ALCOHOL.....	700 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the ammonium carbonate in the diluted solution of ammonia and 140 cc. of distilled water by gentle agitation, and allow the solution to stand for 12 hours. Dissolve the oils in the alcohol, contained in a graduated bottle or cylinder, and gradually add the ammonium carbonate solution and enough distilled water to make the product

measure 1000 cc. Set it aside in a cool place for 24 hours, occasionally agitating the mixture, and then filter, using a covered funnel.

Description—Aromatic Spirit of Ammonia is a nearly colorless liquid when recently prepared, but gradually acquires a yellow color on standing. It has the taste of ammonia, an aromatic and pungent odor, and is affected by light.

Specific gravity—The specific gravity of Aromatic Spirit of Ammonia is about 0.90 at 25° C.

Assay for total ammonia—Measure accurately 10 cc. of Aromatic Spirit of Ammonia, and transfer it to a 200-cc. Erlenmeyer flask containing about 50 cc. of distilled water. Add exactly 30 cc. of half-normal sulfuric acid, and boil until the solution becomes clear. Cool, and titrate the excess of acid with half-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of half-normal sulfuric acid is equivalent to 0.008516 Gm. of NH_3 .

Assay for normal ammonium carbonate—Transfer another 10-cc. portion of Aromatic Spirit of Ammonia, accurately measured, into a flask of about 300-cc. capacity. Add about 30 cc. of half-normal sodium hydroxide, and boil the mixture, replacing the water lost by evaporation, until the vapors no longer turn moist red litmus paper blue. Cool, dilute with 100 cc. of cold, carbon dioxide-free distilled water, add about 6 drops of phenolphthalein T.S., and then just enough half-normal sulfuric acid to discharge the color of the phenolphthalein. Now add about 3 drops of methyl orange T.S., and titrate with half-normal sulfuric acid. Each cc. of half-normal sulfuric acid consumed in the titration with methyl orange T.S. is equivalent to 0.04805 Gm. of $(\text{NH}_4)_2\text{CO}_3$.

Alcohol content—From 62 to 68 per cent, by volume, of $\text{C}_2\text{H}_5\text{OH}$.

Storage—Preserve Aromatic Spirit of Ammonia in tight, light-resistant containers, preferably at a temperature not above 30° C.

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

SPIRITUS ANISI

Spirit of Anise

Sp. Anisi

Spirit of Anise contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of oil of anise.

OIL OF ANISE.....	100 cc.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Mix the oil with sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 5 cc. of Spirit of Anise to a Babcock bottle, graduated to 8 per cent. Attach the bottle to a suction pump, and, while maintaining a relatively high degree of vacuum, evaporate most of the alcohol by repeatedly but carefully immersing the bottle in hot water and immediately withdrawing it. Throughout the operation the bottle must be vigorously rotated, and care must be taken that none of the liquid is drawn out. When most of the alcohol has been removed, cool the liquid, and add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Add sufficient saturated calcium chloride solution,

acidified with hydrochloric acid, almost to fill the bulb of the bottle, rotate it vigorously to insure thorough mixing, and add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 4.2 to obtain the volume of oil of anise in 100 cc. of the Spirit.

Alcohol content—From 80 to 87 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Anise in tight containers, protected from light.

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

SPIRITUS AURANTII COMPOSITUS

Compound Spirit of Orange

Sp. Aurant. Co.

Compound Spirit of Orange contains, in each 100 cc., not less than 25 cc. and not more than 30 cc. of the mixed oils.

OIL OF ORANGE.....	200 cc.
OIL OF LEMON.....	50 cc.
OIL OF CORIANDER.....	20 cc.
OIL OF ANISE.....	5 cc.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Mix the oils with sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 2 cc. of Compound Spirit of Orange to a Babcock bottle, graduated to 8 per cent, add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Then add sufficient saturated calcium chloride solution, acidified with hydrochloric acid, almost to fill the bulb of the bottle. Rotate the bottle vigorously to insure thorough mixing, and then add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and read the volume of oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 10.5 to obtain the volume of mixed oils in 100 cc. of the Spirit.

Alcohol content—From 65 to 70 per cent, by volume, of C_2H_5OH .

Storage—Preserve Compound Spirit of Orange in tight containers, protected from light.

SPIRITUS CAMPHORÆ

Spirit of Camphor

Sp. Camph.

Spirit of Camphor is an alcoholic solution containing, in each 100 cc., not less than 9.2 Gm. and not more than 10.4 Gm. of camphor, at 25° C.

CAMPHOR.....	100 Gm.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the camphor in about 800 cc. of alcohol, and then add enough additional alcohol to make the product measure 1000 cc. Filter if necessary.

Specific gravity—The specific gravity of Spirit of Camphor is not less than 0.824 and not more than 0.826 at 25° C.

Added water—Add 50 mg. of anhydrous potassium carbonate to 5 cc. of Spirit of Camphor: the potassium carbonate does not liquefy and does not adhere to the bottom of the vessel.

Assay—Accurately measure 2 cc. of Spirit of Camphor into a 300-cc. Erlenmeyer flask containing 75 cc. of freshly prepared dinitrophenylhydrazine T.S. and 25 cc. of aldehyde-free alcohol. Connect the flask with a reflux condenser, and heat on a water bath for 4 hours. Add 50 cc. of normal sulfuric acid, allow the mixture to cool, add an additional 150 cc. of normal sulfuric acid, and allow the mixture to stand over night. Transfer the precipitate to a previously dried and weighed filtering crucible, and wash with 10-cc. portions of cold distilled water until the last washing is not acid to litmus paper. Continue the suction until the excess water is removed, and dry the crucible and precipitate to constant weight at 80° C. The weight of the precipitate, multiplied by 0.458, equals the weight of camphor in the 2 cc. of the Spirit of Camphor taken for the assay.

Alcohol content—From 80 to 87 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Camphor in tight containers.

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

SPIRITUS CINNAMOMI

Spirit of Cinnamon

Sp. Cinnam.

Spirit of Cinnamon contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of oil of cinnamon.

OIL OF CINNAMON.....	100 cc.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Mix the oil with sufficient alcohol to make the product measure 1000 cc.

Assay—Proceed as directed under *Spiritus Anisi*, page 425.

Alcohol content—From 80 to 87 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Cinnamon in tight containers, protected from light.

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

SPIRITUS FRUMENTI

Whisky

Sp. Frum.—Whiskey

Whisky is an alcoholic liquid obtained by the distillation of the fermented mash of wholly or partly malted cereal grains, and containing, at 15.56° C., not less than 47 per cent and not more than 53 per cent, by volume, of C_2H_5OH . It must have been stored in charred wood containers for a period of not less than 4 years.

Description—Whisky is a light to deep amber-colored liquid, having a characteristic odor and taste, and an acid reaction.

Specific gravity—The specific gravity of Whisky is not less than 0.923 and not more than 0.935, at 25° C.

Free acid—A 25-cc. portion of Whisky, diluted with 50 cc. of distilled water, requires for neutralization not less than 2 cc. and not more than 6 cc. of tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator.

Total solids, glycerin, sugar—Evaporate 20 cc. of Whisky in a tared dish on a water bath and dry the residue to constant weight at 100° C.: the weight of the residue does not exceed 0.10 Gm. This residue is not sticky, it has a slightly astringent taste but is not distinctly sweet or bitter.

Storage in wood—Add 5 cc. of distilled water to the residue from the preceding test: the residue does not dissolve completely. Filter the mixture and add to the filtrate a drop of dilute ferric chloride T.S. (1 in 10): the liquid is greenish black in color.

Esters—Mix 100 cc. of Whisky with 15 cc. of distilled water and, using an efficient condenser, slowly recover 100 cc. of distillate. Neutralize 50 cc. of the distillate with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, then add exactly 20 cc. more of the tenth-normal sodium hydroxide, and boil the mixture for 1 hour under a reflux condenser. When the liquid has cooled, titrate the excess of alkali with tenth-normal sulfuric acid. Perform a blank determination with distilled water instead of the distillate, using the same quantities of reagents, and in the same manner, and make any necessary correction. The volume of tenth-normal sodium hydroxide consumed is not less than 2 cc. and not more than 8 cc.

Acetone, other ketones, isopropyl alcohol, and tertiary butyl alcohol—To 2 cc. of the distillate from the preceding test, add 3 cc. of distilled water and 10 cc. of mercuric sulfate T.S., and heat on a bath of boiling water: no precipitate forms within 3 minutes.

Alkaloids—Acidulate 10 cc. of Whisky with 5 drops of diluted hydrochloric acid, and evaporate to 5 cc. Dilute with distilled water to 10 cc. and filter. Add a few drops of iodine T.S. or of mercuric potassium iodide T.S. to the filtrate: no precipitate is produced.

Caramel and certain coal tar dyes—Dilute 10 cc. of Whisky with 2 cc. of distilled water, transfer the liquid to a test tube, and add 15 cc. of a mixture of 100 cc. of amyl alcohol, 3 cc. of phosphoric acid, and 3 cc. of distilled water. Shake the mixture gently for 2 minutes and allow the layers to separate completely: the lower aqueous layer is colorless or very nearly so.

Formaldehyde—Mix 2 cc. of an aqueous solution of phloroglucinol (1 in 100) with 5 cc. of sodium hydroxide T.S., and add 2 cc. of Whisky: the mixture has no red color.

Methanol—To 1 drop of the distillate from the test for *esters*, add 1 drop of dilute phosphoric acid (1 in 20), and 1 drop of potassium permanganate solution (1 in 20). Mix, allow to stand 1 minute, and add sodium bisulfite solution (1 in 20) dropwise until the permanganate color is discharged. If a brown color remains, add 1 drop of the diluted phosphoric acid. To the colorless solution add 5 cc. of freshly prepared chromotropic acid T.S. and heat in a water bath for 10 minutes at 60° C.: no violet color appears.

Heavy metals—Evaporate 10 cc. of Whisky to 5 cc. and dilute with 10 cc. of distilled water; acidulate with 5 drops of hydrochloric acid, and add 10 cc. of hydrogen sulfide T.S.: no precipitate is formed either before or after rendering the mixture alkaline with ammonia T.S.

Storage—Preserve Whisky in tight containers.

SPIRITUS GLYCERYLIS TRINITRATIS

Spirit of Glyceryl Trinitrate

Sp. Glyceryl. Trinitrat.—Spirit of Nitroglycerin,
Solutio nitroglycerini spirituosa P.I.

Spirit of Glyceryl Trinitrate is an alcoholic solution containing not less than 1 per cent and not more than 1.1 per cent of $C_3H_5(NO_3)_3$ (mol. wt. 227.09).

Caution—Great care must be exercised in dispensing, handling, packing, transporting, and storing this Spirit, as a dangerous explosion may result if any considerable quantity of it is spilled, and the alcohol wholly or partly lost by evaporation. If, through accident, it is spilled, a solution of potassium or sodium hydroxide should be poured over it at once to decompose the glyceryl trinitrate.

Description—Spirit of Glyceryl Trinitrate is a clear, colorless liquid, having the odor of alcohol. *Caution*—It should not be tasted, since even a small quantity is likely to produce a violent headache. The same effect is produced when it is applied to the skin.

Specific gravity—The specific gravity of Spirit of Glyceryl Trinitrate is not less than 0.814 and not more than 0.820 at 25° C.

Identification—

- A: Heat about 10 cc. of Spirit of Glyceryl Trinitrate on a water bath with 1 cc. of potassium hydroxide T.S. until the alcohol is evaporated, and then heat a portion of the residue with about 1.5 Gm. of potassium bisulfate: the pungent odor of acrolein is evolved.
- B: Dissolve the remainder of the residue from test A in 2 cc. of distilled water, acidify with diluted sulfuric acid, add a few drops of diphenylamine T.S., and pour the solution upon 2 cc. of sulfuric acid in a test tube so as to form a separate layer: a dark blue color is produced at the zone of contact.
- C: On mixing 10 cc. of Spirit of Glyceryl Trinitrate with 11 cc. of distilled water, both previously cooled to 15° C., a clear solution results. On now adding 2 cc. more of distilled water, the mixture becomes turbid at 15° C.

Reaction—Spirit of Glyceryl Trinitrate is neutral to moistened litmus paper.

Assay—Transfer 25 cc. of Spirit of Glyceryl Trinitrate to a previously weighed, 50-cc. volumetric flask, stopper the flask, and weigh accurately. Add 3 cc. of an aqueous solution of sodium hydroxide (1 in 5), re-stopper the flask, and allow it to stand at room temperature for 1 hour. Then add sufficient aldehyde-free alcohol to make the total volume measure 50 cc., stopper, and mix thoroughly. Proceed with the determination as directed under the *Nitrite Assay*, page 597, using 20 cc. of the solution. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.01135 Gm. of glyceryl trinitrate $[C_3H_5(NO_3)_3]$.

Alcohol content—From 88 to 95 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Glyceryl Trinitrate in tight, light-resistant containers, preferably at a temperature not above 30° C.

AVERAGE DOSE—Metric, 0.06 cc.—Apothecaries, 1 minim.

SPIRITUS LAVANDULÆ

Spirit of Lavender

Sp. Lavand.

Spirit of Lavender contains, in each 100 cc., not less than 4 cc. and not more than 6 cc. of oil of lavender.

OIL OF LAVENDER.....	50 cc.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Mix the oil with sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 10 cc. of Spirit of Lavender to a Babcock bottle, graduated to 8 per cent, add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Then add sufficient saturated calcium chloride solution, acidified with hydrochloric acid, almost to fill the bulb of the bottle. Rotate the bottle vigorously to insure thorough mixing, then add a sufficient quantity of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of the oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 2.2 to obtain the volume of oil in 100 cc. of the Spirit.

Alcohol content—From 85 to 92 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Lavender in tight containers, protected from light.

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

SPIRITUS MENTHÆ PIPERITÆ

Spirit of Peppermint

Sp. Menth. Pip.—Essence of Peppermint

Spirit of Peppermint contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of oil of peppermint.

OIL OF PEPPERMINT.....	100 cc.
PEPPERMINT, <i>in coarse powder</i>	10 Gm.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Macerate the peppermint leaves, freed as much as possible from stems and coarsely powdered, during 1 hour in 500 cc. of distilled water, and then strongly express them. Add the moist, macerated leaves to 900

cc. of alcohol, and allow the mixture to stand during 6 hours with frequent agitation. Filter, and to the filtrate add the oil and sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 5 cc. of Spirit of Peppermint to a Babcock bottle, graduated to 8 per cent, add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Then add sufficient saturated calcium chloride solution, acidified with hydrochloric acid, almost to fill the bulb of the bottle. Rotate the bottle vigorously to insure thorough mixing, then add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 4.2 to obtain the volume of oil of peppermint, in 100 cc. of the Spirit.

Alcohol content—From 79 to 85 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Peppermint in tight containers, protected from light.

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

SPIRITUS MENTHÆ VIRIDIS

Spirit of Spearmint

Sp. Menth. Vir.

Spirit of Spearmint contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of oil of spearmint.

OIL OF SPEARMINT.....	100 cc.
SPEARMINT, in coarse powder.....	10 Gm.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Macerate the spearmint leaves, freed as much as possible from stems and coarsely powdered, during 1 hour in 500 cc. of distilled water, and then strongly express them. Add the moist, macerated leaves to 900 cc. of alcohol, and allow the mixture to stand during 6 hours with frequent agitation. Filter, and to the filtrate add the oil and sufficient alcohol to make the product measure 1000 cc.

Assay—Proceed as directed under *Spiritus Menthæ Piperitæ*, page 430.

Alcohol content—From 79 to 85 per cent, by volume, of C_2H_5OH .

Storage—Preserve Spirit of Spearmint in tight containers, protected from light.

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

SPIRITUS VINI VITIS

Brandy

Sp. Vin. Vit.

Brandy is an alcoholic liquid obtained by the distillation of the fermented juice of sound ripe grapes and containing, at 15.56° C., not less than 48 per cent and not more than 54 per cent, by volume, of C_2H_5OH . It must have been stored in wood containers for a period of not less than 4 years.

Description—Brandy is a pale amber-colored liquid, having a characteristic odor and taste, and an acid reaction.

Specific gravity—The specific gravity of Brandy is not less than 0.921 and not more than 0.933 at 25° C.

Free acid—A 25-cc. portion of Brandy, diluted with 50 cc. of recently boiled distilled water, requires for neutralization not more than 3.8 cc. of tenth-normal sodium hydroxide, using 3 drops of phenolphthalein T.S. as the indicator.

Total solids—Evaporate 20 cc. of Brandy in a tared dish on a water bath, and dry the residue to constant weight at 100° C.: the weight of the residue does not exceed 0.30 Gm.

Storage in wood—Treat the residue from the test for *total solids* with 5 cc. of distilled water, filter, and add to the filtrate a drop of diluted ferric chloride T.S. (1 in 10): the mixture has a greenish black color.

Other tests—Brandy meets the requirements of the tests for *acetone, other ketones, isopropyl alcohol, tertiary butyl alcohol, alkaloids, caramel and certain coal tar dyes, formaldehyde, methanol, and heavy metals* under *Spiritus Frumenti*, page 428.

Storage—Preserve Brandy in tight containers.

STOMACHUS PULVERATUS

Powdered Stomach

Stomach. Pulv.—Stomachus U. S. P. XI, Dried Stomach

Powdered Stomach is the dried and powdered defatted wall of the stomach of the hog, *Sus scrofa* Linné var. *domesticus* Gray (Fam. *Suidæ*). It contains factors which cause an increase in the number of red blood corpuscles in the blood of persons suffering from pernicious anemia. The activity is readily destroyed when the preparation is suspended in a hot liquid. The approximate anti-anemic potency of Powdered Stomach in pernicious anemia is expressed in U. S. P. Units and conforms to all other provisions outlined under *Anti-anemia Preparations*, page 553.

Storage—Preserve Powdered Stomach in well-closed containers, preferably in a cool place.

AVERAGE DOSE—One U. S. P. Unit daily.

STRAMONIUM

Stramonium

Stramon.—Jimson Weed, Jamestown Weed

Stramonium consists of the dried leaf and flowering top of *Datura Stramonium* Linné (including *Datura Tatula* Linné) (Fam. *Solanaceæ*).

Stramonium yields not less than 0.25 per cent of the alkaloids of Stramonium. It contains not more than 3 per cent of stems over 8 mm. in diameter, and yields not more than 4 per cent of acid-insoluble ash, page 629.

Description—

Unground Stramonium.—More or less matted, wrinkled, and crushed; leaves petiolate, ovate, or triangular-ovate; apex acuminate, base unequal; margin sinuate, toothed, or angled, the teeth few, acute, and with rounded sinuses; the lamina usually shows small, circular perforations, surrounded by cork or sometimes filled with cork, surfaces usually sparsely hairy, the hairs mostly upon the veins; color of both upper and lower surfaces of lamina, grayish green to light olive brown to dusky olive green. Flowers solitary in the forks of the branches on a short pedicel; calyx green, 5-toothed; corolla white or purplish, plicate, funnel-shaped; stamens 5, epipetalous; pistil bicarpellate with a conical ovary covered with short, stiff emergences. Stems often flattened, longitudinally wrinkled, occasionally with one or more deep furrows; light olive brown to purplish brown. Odor distinct, heavy and narcotic; taste unpleasant and nauseous.

Histology—Leaf: Upper epidermis of thin-walled cells, with few stomata of solanaceous type and hairs; palisade, 1-layered, and resting upon a single row of small parenchyma cells extending through the middle of the blade, nearly every cell of the layer containing a rosette aggregate of calcium oxalate; spongy parenchyma loosely arranged; lower epidermis similar to the upper but more uneven and with more stomata, the latter slightly elevated and with guard cells nearly circular in outline and distinctly beaked. Midrib convex above and below, exhibiting an upper and lower epidermis with thick-walled cells, directly beneath either of which is a zone of collenchyma, and in the center a meristele of bicollateral bundles surrounded by parenchyma, many cells of which contain either microcrystals or prisms of calcium oxalate.

Powdered Stramonium.—Bright green, or light olive brown to dusky yellowish green; epidermal cells of lamina with wavy radial walls; stomata elliptical, about 25 microns in length, usually with 3 neighboring cells, one smaller than the others; calcium oxalate in rosette aggregates, from 10 to 25 microns in diameter, or in prisms; non-glandular hairs of leaf few, 2- to 6-celled, attaining a length of about 500 microns, the basal cell being usually more than 50 microns in length and from 35 to 40 microns in diameter at the base, some of the cells more or less collapsed, the outer walls with numerous slight centrifugal projections; glandular hairs few, with 1- to 2-celled, usually curved stalks and 2- to 4-celled glandular heads; tracheæ annular or spiral. Stem fragments with epidermal hairs up to 800 microns in length, occasional pericyclic fibers, annular or spiral tracheæ or tracheæ with simple or bordered pores associated with wood parenchyma or wood-fibers; midrib fragments with long, narrow, unequally thickened collenchymatous cells associated with parenchyma cells, some of the latter containing sphenoidal microcrystals and prisms.

Assay.—Proceed as directed under the *Assay of Hyoscyamus*, page 218, using 10 Gm. of Stramonium. Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of Stramonium.

U. S. P. Products of Stramonium.—Extractum Stramonii (pilular and powdered), Tinctura Stramonii.

STROPHANTHINUM

Strophanthin

Strophanthin.

A glycoside or a mixture of glycosides obtained from *Strophanthus Kombe* Oliver (Fam. *Apocynaceæ*).

Strophanthin, when assayed as directed, shall possess a potency per mg. equivalent to 0.5 mg. of U. S. P. Ouabain Reference Standard, page 607.

Description—Strophanthin is a white or yellowish powder containing varying proportions of water, which it does not lose entirely without decomposition. It is stable in air.

Caution—*Strophanthin is extremely poisonous.*

Solubility—Strophanthin is soluble in water and in diluted alcohol, but less soluble in dehydrated alcohol. It is nearly insoluble in chloroform, in ether, and in benzene.

Identification—

- A: When added to Strophanthin sulfuric acid produces an emerald green color which becomes brown.
- B: Add a trace of ferric chloride T.S. and a few cc. of sulfuric acid to an aqueous solution of Strophanthin (1 in 50): there appears in the liquid a red precipitate which becomes dark green in 1 or 2 hours.
- C: A solution of 0.1 Gm. of Strophanthin in 15 cc. of distilled water, when mixed with 5 cc. of hot alkaline cupric tartrate solution, produces no precipitate. Mix an aqueous solution of Strophanthin with a small amount of diluted hydrochloric acid, and heat the mixture to 70° C.: the Strophanthin is hydrolyzed into strophanthidin, which precipitates, and a sugar, capable of reducing alkaline cupric tartrate T.S., remains in solution.
- D: An aqueous solution of Strophanthin is dextrorotatory, page 601.

Ash—The ash from 0.1 Gm. of Strophanthin is negligible.

Reaction—An aqueous solution of Strophanthin is neutral to litmus paper.

Assay—*The standard preparation of ouabain*—Prepare a solution of the Ouabain Reference Standard by dissolving a weighed amount in sufficient alcohol to make a 1 to 1000 solution with an accuracy within 1 per cent. Preserve this as a stock solution in a cold place in a tight container of Type 1 glass, page 567. This standard preparation shall not be used in the assay after six months.

The stock preparation of strophanthin—Prepare and preserve this stock preparation in the same manner as the *standard preparation of ouabain*.

Preparation of the test dilutions—Dilute the standard preparation of ouabain and the stock solution of Strophanthin in such a manner that the estimated fatal dose per Kg. of cat is diluted to 15 cc. with a solution of 0.9 per cent of sodium chloride in distilled water. These dilutions shall not be used for assay after 24 hours.

Then proceed with the Assay as directed under *Tinctura Digitalis*, page 510, beginning with the second paragraph, and substituting the *standard preparation of ouabain* for the *standard preparation of digitalis*. If necessary, adjust the finished product to conform to the official potency by admixture with a sufficient quantity of a more potent or less potent strophanthin, or with sodium chloride. After the adjustment, repeat the assay to insure compliance with the required potency.

Storage—Preserve Strophanthin in tight, light-resistant containers.

U. S. P. Product of Strophanthin—Injectio Strophanthini.

AVERAGE DOSE—Intravenous, Metric 0.5 mg.—Apothecaries,
 $\frac{1}{120}$ grain.

STRYCHNINÆ SULFAS

Strychnine Sulfate

Strych. Sulf.

 $(C_{21}H_{22}N_2O_2)_2 \cdot H_2SO_4 \cdot 5H_2O$

Mol. wt. 856.96

Strychnine Sulfate is the sulfate of an alkaloid obtained chiefly from *nux vomica*.

Description—Strychnine Sulfate occurs as colorless or white crystals, or as a white, crystalline powder without odor. It is efflorescent in dry air.

Caution—Strychnine Sulfate is extremely poisonous.

Solubility—One Gm. of Strychnine Sulfate dissolves in 35 cc. of water, in 85 cc. of alcohol, and in about 220 cc. of chloroform, at 25° C. One Gm. dissolves in 7 cc. of boiling water, and in 25 cc. of alcohol at 70° C. It is freely soluble in glycerin but insoluble in ether.

Identification—

A: An aqueous solution of Strychnine Sulfate is levorotatory, page 601.

B: Add a fragment of potassium dichromate to a solution of 0.1 Gm. of Strychnine Sulfate in 2 cc. of sulfuric acid. The mixture immediately assumes a deep blue color which changes to deep violet, then to purplish red, cherry red, and finally to orange or yellow.

C: Sulfuric Acid containing 1 per cent of ammonium vanadate produces with Strychnine Sulfate a deep violet blue color, which changes to a deep purple and finally to a cherry red.

D: An aqueous solution of Strychnine Sulfate (1 in 50) responds to the test for sulfate, page 592.

Loss on drying—When dried at 105° C. for 6 hours, Strychnine Sulfate loses not more than 11.5 per cent of its weight.

Ash—Strychnine Sulfate yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.2 Gm. of Strychnine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Free acid—A solution of 0.5 Gm. of Strychnine Sulfate in 20 cc. of distilled water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Brucine—Add 1 cc. of a mixture of equal volumes of nitric acid and distilled water to about 0.1 Gm. of Strychnine Sulfate: the mixture may be yellow, but not red or reddish in color.

Storage—Preserve Strychnine Sulfate in tight, light-resistant containers.

U. S. P. Product of Strychnine Sulfate—Tabellæ Strychninæ Sulfatis.

AVERAGE DOSE—Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain.

STYRAX

Storax

Liquid Storax

Storax is a balsam obtained from the trunk of *Liquidambar orientalis* Miller, known in commerce as Levant Storax, or of *Liquidambar styraciflua* Linné, known in commerce as American Storax (Fam. *Hamelidaceæ*).

Description—A semi-liquid, grayish to grayish brown, sticky, opaque mass, depositing on standing a heavy dark brown layer (Levant Storax); or a semi-solid, sometimes a solid mass, softened by gentle warming (American Storax). Storax

is transparent in thin layers, has a characteristic odor and taste, and is more dense than water.

Solubility—Storax is insoluble in water, but soluble, usually incompletely, in an equal weight of warm alcohol. It is also soluble in acetone, in carbon disulfide, and in ether, some insoluble residue usually remaining.

Loss on drying—Dry about 2 Gm. of well-mixed Storax, accurately weighed, for 2 hours at 100° C.: it loses not more than 20 per cent of its weight.

Rosin or rosin oil—Triturate about 2 Gm. of Storax with 25 cc. of purified benzin in a small beaker for 5 minutes. Filter the mixture, and place 10 cc. of the filtrate in a dry test tube. Add 5 cc. of dilute sulfuric acid (made by mixing equal volumes of sulfuric acid and distilled water and cooling the mixture), shake it vigorously, and allow the mixture to settle. Add acetic anhydride, drop by drop: the mixture exhibits no violet or purple band.

Alcohol-insoluble residue—Dissolve about 10 Gm. of well-mixed Storax, accurately weighed, in 100 cc. of hot alcohol, filter through counterbalanced filters or a tared Gooch crucible, and wash the residue with small portions of hot alcohol until the last washing is colorless or very nearly so: the weight of the residue after drying at 100° C. does not exceed 5 per cent of the weight of Storax taken for the test.

Alcohol-soluble residue—Evaporate the combined alcohol filtrate and washings obtained in the test for alcohol-insoluble residue at a temperature not exceeding 60° C., and dry the residue for 1 hour at 100° C.: a yellow to brown residue of purified Storax remains, corresponding to not less than 70 per cent of the weight of the Storax taken.

The purified Storax obtained in the test for alcohol-soluble residue complies with the following tests:

Acid value—Dissolve about 1 Gm. of the purified Storax, accurately weighed, in 50 cc. of neutralized alcohol, add 0.5 cc. of phenolphthalein T.S., and titrate with half-normal sodium hydroxide: the acid value, page 573, is from 50 to 85 for Levant Storax and from 36 to 85 for American Storax.

Saponification value—Place about 2 Gm. of the purified Storax, accurately weighed, in a 250-cc. flask, mix it with 50 cc. of purified benzin, add 25 cc. of half-normal alcoholic potassium hydroxide, and allow the mixture to stand for 24 hours with frequent agitation. Then add 0.5 cc. of phenolphthalein T.S., and titrate the excess of alkali with half-normal hydrochloric acid: the saponification value thus determined is not less than 160 and not more than 200, page 579.

Cinnamic acid—Add about 2 Gm. of the purified Storax, accurately weighed, to 25 cc. of half-normal alcoholic potassium hydroxide, and boil the mixture for 1 hour under a reflux condenser. Neutralize with half-normal sulfuric acid, using 5 drops of phenolphthalein T.S. as the indicator, and evaporate the alcohol on a water bath. Dissolve the residue in 50 cc. of distilled water, and shake the solution with 20 cc. of ether. Shake the separated ether with 5 cc. of distilled water, add the wash water to the aqueous solution, and reject the ether extract. Add to the aqueous solution 10 cc. of diluted sulfuric acid, and shake with four successive portions of 20 cc. each of ether. Wash the combined ether extracts with 5 cc. of distilled water, rejecting the water washings, transfer to a flask, and distil off the ether. Add to the residue 100 cc. of distilled water, and boil the mixture vigorously for 15 minutes under a reflux condenser. Filter while hot, and allow the filtrate to cool to about 25° C.: white crystals of cinnamic acid separate. Collect the cinnamic acid in a Gooch crucible, finally using reduced pressure to drain the crystals completely. Repeat the extraction of the residue twice by boiling each time under a reflux condenser, as before described, with the filtrate from the preceding crystallization, and collect the additional cinnamic acid in the same crucible. Finally wash the cinnamic acid with two 10-cc. portions of ice-cold, distilled water, dry at 80° C., and weigh. The weight of the cinnamic acid thus obtained is equivalent to not less than 25 per cent of the purified Storax taken.

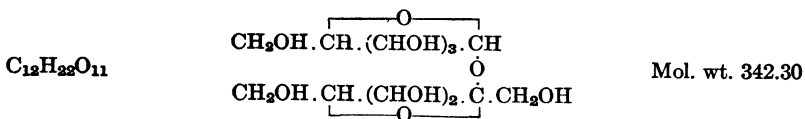
To about 0.05 Gm. of the cinnamic acid obtained above, add 5 cc. of diluted sulfuric acid, heat, and add potassium permanganate T.S.: the mixture evolves the odor of benzaldehyde. A portion of the acid recrystallized from hot distilled water melts between 134° and 135° C.

U. S. P. Product of Storax—Tinctura Benzoini Composita.

SUCROSUM

Sucrose

Sucros.—Saccharum, Sugar



Sucrose is a sugar obtained from *Saccharum officinarum* Linné (Fam. *Gramineæ*), *Beta vulgaris* Linné (Fam. *Chenopodiaceæ*), and other sources.

Description—Sucrose occurs as colorless or white crystals, crystalline masses or blocks, or as a white, crystalline powder. It is odorless, has a sweet taste, and is stable in air.

Solubility—One Gm. of Sucrose dissolves in 0.5 cc. of water and in 170 cc. of alcohol, at 25° C., and in slightly more than 0.2 cc. of boiling water. It is insoluble in chloroform and in ether.

Specific rotation—The specific rotation $[\alpha]$ of Sucrose determined at 20° C. in an aqueous solution containing in each 100 cc. 26 Gm. of Sucrose, previously dried to constant weight at 105° C., and using a 200-mm. tube, is not less than +65.9°, page 601.

Ash—Sucrose yields not more than 0.05 per cent of ash, page 556.

Reaction—An aqueous solution of Sucrose (1 in 20) is neutral to litmus paper.

Sulfate—A 5-Gm. portion of Sucrose shows no more *sulfate* than corresponds to 0.3 cc. of fiftieth-normal sulfuric acid, page 626.

Chloride—A 10-cc. portion of an aqueous solution of Sucrose (1 in 10) remains clear for at least 1 minute after the addition of 1 cc. of silver nitrate T.S.

Calcium—A 10-cc. portion of an aqueous solution of Sucrose (1 in 10) remains clear for at least 1 minute after the addition of 1 cc. of ammonium oxalate T.S.

Heavy metals—Dissolve 3 Gm. of Sucrose in 15 cc. of distilled water, add 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with distilled water: the heavy metals limit, page 586, for Sucrose is 5 parts per million.

Insoluble salts, ultramarine or Prussian blue—An aqueous solution of Sucrose (1 in 1) is colorless or at most appears only faintly yellow when viewed transversely against a white background, in a cylinder of colorless glass, having an inside diameter of about 25 mm. When kept in large, well-closed, and completely filled bottles, the solution deposits no sediment on prolonged standing.

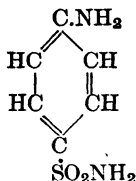
Invert sugar—Dissolve 20 Gm. of Sucrose in enough distilled water to make 100 cc. of solution, and filter if necessary. To 50 cc. of the clear liquid contained in a 250-cc. beaker, add 50 cc. of alkaline cupric tartrate T.S., cover the beaker with a watch glass, heat the mixture at such a rate that it requires approximately 4 minutes to bring it to the boiling point, and boil for exactly 2 minutes. Add at once 100 cc. of cold, recently boiled, distilled water, and immediately collect and weigh the precipitated cuprous oxide in the following manner: Prepare a Gooch crucible with an asbestos layer. Thoroughly wash the asbestos with distilled water, followed successively by 10 cc. of alcohol and 10 cc. of ether, dry at 100° C. for 30 minutes, and weigh the prepared crucible. Filter the precipitated cuprous oxide through the crucible thus prepared, thoroughly wash the residue on the filter with hot distilled water, then with 10 cc. of alcohol, and finally with 10 cc. of ether, and dry at 100° C. for 30 minutes. The weight of the cuprous oxide does not exceed 0.112 Gm., corresponding to not more than 0.3 per cent of invert sugar.

Storage—Preserve Sucrose in well-closed containers.

SULFANILAMIDUM

Sulfanilamide

Sulfanilamid.

 $\text{C}_6\text{H}_8\text{N}_2\text{O}_2\text{S}$

Mol. wt. 172.20

Sulfanilamide, when dried at 100°C . for 4 hours, contains not less than 99 per cent of $\text{C}_6\text{H}_8\text{N}_2\text{O}_2\text{S}$.

Description—Sulfanilamide occurs as white crystals, granules, or powder. It is odorless and is affected by light.

Solubility—One Gm. of Sulfanilamide dissolves in about 125 cc. of water, in about 37 cc. of alcohol, and in about 5 cc. of acetone, at 25°C . It is also soluble in glycerin, in hydrochloric acid, and in aqueous solutions of potassium and sodium hydroxides. It is very soluble in boiling water. It is insoluble in chloroform, in ether, and in benzene.

Melting point—Sulfanilamide melts between 164.5° and 166.5°C ., page 595.

Identification—

A: Add 5 cc. of diluted hydrochloric acid to about 0.1 Gm. of Sulfanilamide, and boil gently for about 5 minutes. Cool in an ice bath, then add 4 cc. of an aqueous solution of sodium nitrite (1 in 100), dilute with distilled water to 10 cc., and place the mixture in an ice bath for 10 minutes. To 5 cc. of the cooled mixture add a solution of 50 mg. of betanaphthol in 2 cc. of an aqueous solution of sodium hydroxide (1 in 10): an orange precipitate is produced.

B: Carefully heat about 50 mg. of Sulfanilamide in a small test tube over an open flame until it melts: an intense violet blue color develops. On further heating the odors of ammonia and of aniline are evolved.

Loss on drying—Dry about 1 Gm. of Sulfanilamide, accurately weighed, at 100°C . for 4 hours: it loses not more than 0.5 per cent of its weight.

Ash—Sulfanilamide yields not more than 0.1 per cent of ash, page 556.

Reaction—Dissolve 1.5 Gm. of Sulfanilamide in 75 cc. of hot distilled water, cool at once to about 20°C ., dilute with distilled water to 75 cc., and filter: the filtrate is neutral to litmus paper.

Chloride—A 25-cc. portion of the filtrate prepared for the test for *reaction* shows no more *chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A 25-cc. portion of the filtrate prepared for the test for *reaction* shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Dissolve 0.5 Gm. of Sulfanilamide in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of distilled water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 586, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 0.5 Gm. of Sulfanilamide, previously dried for 4 hours at 100°C ., and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of distilled water, stir until dissolved, cool to 15°C ., add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite, stirring vigorously, until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When

the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 0.01722 Gm. of $C_6H_5N_2O_2S$.

Storage—Preserve Sulfanilamide in well-closed, light-resistant containers.

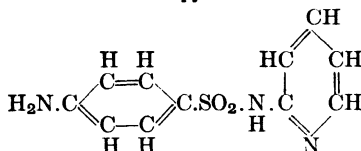
U. S. P. Product of Sulfanilamide—Tabellæ Sulfanilamidi.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SULFAPYRIDINUM

Sulfapyridine

Sulfapyridin.



$C_{11}H_{11}N_3O_2S$

Mol. wt. 249.28

Sulfapyridine, when dried at 100°C . for 4 hours, contains not less than 99 per cent of $C_{11}H_{11}N_3O_2S$.

Description—Sulfapyridine occurs as white or faintly yellowish white crystals, granules, or powder. It is odorless or nearly so, and is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Sulfapyridine dissolves in about 3500 cc. of water, in about 440 cc. of alcohol, and in about 65 cc. of acetone at 25°C . It is freely soluble in dilute mineral acids and in aqueous solutions of potassium and sodium hydroxides.

Melting point—Sulfapyridine melts between 191° and 193°C ., page 595.

Identification—

- A: Add 5 cc. of diluted hydrochloric acid to 0.1 Gm. of Sulfapyridine, and boil gently for about 5 minutes. Cool in an ice bath, then add 4 cc. of an aqueous solution of sodium nitrite (1 in 100), dilute with distilled water to 10 cc., and place the mixture in an ice bath for 10 minutes. To 5 cc. of the cooled mixture add a solution of 50 mg. of betanaphthol in 2 cc. of an aqueous solution of sodium hydroxide (1 in 10): an orange-red precipitate is produced which darkens on standing.
- B: Carefully heat about 50 mg. of Sulfapyridine in a small test tube over an open flame or in a sand bath until it melts: a brown color develops. On further heating, yellow fumes appear and an odor of sulfur dioxide is evolved. (Sulfanilamide produces a blue violet color and the odor of ammonia.)
- C: To about 20 mg. of Sulfapyridine suspended in 5 cc. of distilled water add, dropwise, sodium hydroxide T.S. until dissolved; then add 2 or 3 drops of copper sulfate T.S.: a green precipitate is formed which becomes grayish on standing. (Sulfathiazole gives a purple precipitate and sulfanilamide gives a blue color or precipitate.)

Loss on drying—Dry about 1 Gm. of Sulfapyridine, accurately weighed, at 105°C ., for 4 hours: it loses not more than 0.5 per cent of its weight.

Ash—Sulfapyridine yields not more than 0.1 per cent of ash, page 556.

Clarity and color of solution—A solution of 1 Gm. of Sulfapyridine in a mixture of 20 cc. of distilled water and 5 cc. of sodium hydroxide T.S. is clear and colorless.

Acidity—Digest 2 Gm. of Sulfapyridine with 100 cc. of distilled water at about 70° C. for 5 minutes, cool at once to about 20° C., and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide: not more than 0.1 cc. of the sodium hydroxide is required to produce a pink color.

Chloride—A 25-cc. portion of the filtrate prepared for the test for *acidity* shows no more *chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Another 25-cc. portion of the filtrate prepared for the test for *acidity* shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Dissolve 0.5 Gm. of Sulfapyridine in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of distilled water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 586, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 0.5 Gm. of Sulfapyridine, previously dried for 4 hours at 100° C., and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of distilled water, cool to 15° C., add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite, stirring vigorously, until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 0.02493 Gm. of $C_{11}H_{11}N_3O_2S$.

Storage—Preserve Sulfapyridine in well-closed, light-resistant containers.

U. S. P. Product of Sulfapyridine—Tabellæ Sulfapyridini.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SULFAPYRIDINUM SODICUM STERILE

Sterile Sulfapyridine Sodium

Sulfapyridin. Sod. Steril.—Sterile Sodium Sulfapyridine

$C_{11}H_{10}N_3O_2SNa \cdot H_2O$

Mol. wt. 289.29

Sterile Sulfapyridine Sodium, when dried at 105° C. for 4 hours, contains not less than 99 per cent of anhydrous $C_{11}H_{10}N_3O_2SNa$. It meets the requirements of the *Sterility Tests for Solids*, page 610.

Description—Sterile Sulfapyridine Sodium occurs as white, odorless crystals or powder. On prolonged exposure to humid air it absorbs carbon dioxide with the liberation of sulfapyridine and becomes incompletely soluble in water. It is affected by light.

Solubility—One Gm. of Sterile Sulfapyridine Sodium dissolves in about 1.5 cc. of water and in about 10 cc. of alcohol at 25° C.

Identification—

A: Dissolve about 1 Gm. of Sterile Sulfapyridine Sodium in 25 cc. of distilled water, and add 2 cc. of acetic acid. A white precipitate of sulfapyridine is formed. Collect the precipitate on a filter, wash it well with cold distilled water, and dry for 4 hours at 100° C. The sulfapyridine so obtained melts between 191° and 193° C. and responds to *identification tests A, B, and C* under *Sulfapyridinum*, page 439.

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B: Ignite about 0.5 Gm. of Sterile Sulfapyridine Sodium: the residue responds to the tests for sodium, page 592.

Reaction—An aqueous solution of Sterile Sulfapyridine Sodium (1 in 20) is alkaline to phenolphthalein.

Loss on drying—When dried at 105° C. for 4 hours, Sterile Sulfapyridine Sodium loses not less than 5 per cent and not more than 7 per cent of its weight.

Chloride—Dissolve 2 Gm. of Sterile Sulfapyridine Sodium in 45 cc. of distilled water, add 5 cc. of acetic acid, and filter. One-half of the filtrate shows no more *chloride* than corresponds to 0.15 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—The remaining half of the filtrate from the test for *chloride* shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Dissolve 0.5 Gm. of Sterile Sulfapyridine Sodium in 25 cc. of distilled water, and add 5 drops of sodium sulfide T.S. If a dark color is produced, it is not darker than that produced in a control to which 1 cc. of the standard lead solution, page 586, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 0.5 Gm. of Sterile Sulfapyridine Sodium, previously dried at 105° C. for 4 hours, transfer it to a 250-cc. beaker, and proceed with the assay as directed under *Sulfapyridinum*, page 439, beginning with "add 5 cc. of hydrochloric acid." Each cc. of tenth-molar sodium nitrite is equivalent to 0.02713 Gm. of $C_{11}H_{10}N_3O_2SNa$.

Storage—Preserve Sterile Sulfapyridine Sodium in containers so closed that the sterility of the product is maintained until the package is opened for use. Each package shall contain not more than 10 Gm. of Sterile Sulfapyridine Sodium. The quantity of Sterile Sulfapyridine Sodium and the lot number must be stated on the label of each package. The container may be of such size as to permit solution within the container.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SULFARSPHENAMINA

Sulfarsphenamine

Sulfarsphen.

Sulfarsphenamine consists chiefly of disodium 3,3'-diamino-4,4'-dihydroxyarsenobenzene-*N*-dimethylenesulfonate. It contains not less than 19 per cent of Arsenic (As).

Sulfarsphenamine must be prepared in an establishment licensed for the purpose by the United States Government upon recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Description—Sulfarsphenamine occurs as a yellow powder. It is odorless or has a very slight odor resembling sulfur dioxide. In the dry state or in solution it is slowly oxidized by exposure to air, becoming dark and more toxic.

Solubility—Sulfarsphenamine is very soluble in water, yielding a yellow solution; it is slightly soluble in alcohol, and insoluble in ether.

Use recently boiled distilled water in the following tests:

Identification—

- A: The solution resulting from the *Assay for arsenic* yields with hydrogen sulfide a yellow precipitate, which is soluble in ammonium carbonate T.S.
- B: Mix 0.5 cc. of diluted hydrochloric acid with 20 cc. of an aqueous solution of Sulfarsphenamine (1 in 100): no precipitate is formed (Neoarsphenamine yields a heavy precipitate within 1 minute).
- C: Add sodium hydroxide T.S., drop by drop, to 10 cc. of an aqueous solution of Sulfarsphenamine (1 in 100): no precipitate is produced (Arsphenamine yields a precipitate which dissolves readily in an excess of the reagent).
- D: Add 2 drops of freshly prepared ferric chloride T.S. to 5 cc. of an aqueous solution of Sulfarsphenamine (1 in 1000): a dark red color is produced.
- E: To 10 cc. of an aqueous solution of Sulfarsphenamine (1 in 100) add 10 cc. of diluted hydrochloric acid, and heat: the odor of sulfur dioxide is perceptible.
- F: An aqueous solution of Sulfarsphenamine (1 in 100) is acid to litmus (a similar solution of Neoarsphenamine is neutral or faintly alkaline).

Completeness of solubility—Add 0.6 Gm. of Sulfarsphenamine to 3 cc. of distilled water in a test tube or small cylinder and gently rotate the mixture: complete solution results within 5 minutes.

Thermostability—Expose the ampuled product to a temperature of 70° C. for 48 hours: it shows no marked change in color, consistency, or solubility.

Assay—Place about 0.2 Gm. of Sulfarsphenamine, accurately weighed, in a glass-stoppered, 200- to 300-cc. flask. Add 1 Gm. of finely powdered potassium permanganate and 5 cc. of diluted sulfuric acid, and allow to stand for 10 minutes, rotating the contents of the flask during this time to insure thorough mixing. Cautiously add 10 cc. of sulfuric acid in portions of about 2 cc., rotating the flask after each addition. When the reaction has ceased, add sufficient hydrogen peroxide T.S. to dissolve completely the brown precipitate (about 5 to 7 cc.). Toward the end of the reaction add the hydrogen peroxide T.S. drop by drop to avoid any great excess. Dilute with 25 cc. of distilled water, and boil gently over an asbestos-wire gauze for 15 to 20 minutes, or until the excess of hydrogen peroxide is expelled. Dilute with 50 cc. of distilled water, and add tenth-normal potassium permanganate until the liquid is faintly pink, then discharge the pink color by the addition of a drop of tenth-normal oxalic acid. Cool the solution, add 2.5 Gm. of potassium iodide, stopper the flask tightly, and allow it to stand in a cool, dark place for 1 hour. Then titrate the liberated iodine with tenth-normal sodium thiosulfate without the use of starch indicator. Perform a blank test with the same quantities of reagents and in the same manner and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003746 Gm. of As.

Storage—Preserve Sulfarsphenamine in a cool place, preferably not above 20° C., in sealed tubes of colorless glass, from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams of the Sulfarsphenamine contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label upon the outside of the container of one or more ampuls must bear the official title, the amount in grams of the Sulfarsphenamine contained in each ampul, the lot number of the product, the name and address of the manufacturer, the U. S. license number of the manufacturer, and the expiration date for the product.

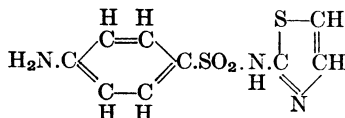
The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its stability) shall not be more than 5 years from the date of release of that lot by the National Institute of Health.

AVERAGE DOSE—Intramuscular, Metric, 0.45 Gm.—Apothecaries, 7 grains.

SULFATHIAZOLUM

Sulfathiazole

Sulfathiazol.

 $\text{C}_9\text{H}_9\text{N}_3\text{O}_2\text{S}_2$

Mol. wt. 255.31

Sulfathiazole, when dried at 100° C. for 4 hours, contains not less than 99 per cent of $\text{C}_9\text{H}_9\text{N}_3\text{O}_2\text{S}_2$.

Description—Sulfathiazole occurs as white or faintly yellowish white crystals, granules, or powder. It is odorless or nearly so, and is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Sulfathiazole dissolves in about 1700 cc. of water, and in about 200 cc. of alcohol, at 25° C. It is soluble in acetone, and freely soluble in diluted mineral acids, in aqueous solutions of potassium and sodium hydroxides, and in ammonia T.S.

Melting point—Sulfathiazole melts between 200° and 204° C., page 595.

Identification—

- A: Add 5 cc. of diluted hydrochloric acid to 0.1 Gm. of Sulfathiazole, and boil gently for about 5 minutes. Cool in an ice bath, then add 4 cc. of an aqueous solution of sodium nitrite (1 in 100), dilute with water to 10 cc., and place the mixture in an ice bath for 10 minutes. To 5 cc. of the cooled mixture, add a solution of 50 mg. of betanaphthol in 2 cc. of aqueous solution of sodium hydroxide (1 in 10): an orange-red precipitate is produced which darkens on standing.
- B: Carefully heat about 50 mg. of Sulfathiazole in a small test tube over an open flame until it melts. A brown to red color develops, and on further heating the odors of ammonia, aniline, and hydrogen sulfide are evolved. (Sulfanilamide produces a blue-violet color and the odor of ammonia and sulapyridine evolves the odor of sulfur dioxide.)
- C: To about 20 mg. of Sulfathiazole suspended in 5 cc. of distilled water add, dropwise, sodium hydroxide T.S. until dissolved, then add 2 or 3 drops of cupric sulfate T.S.: a purple precipitate forms. (Sulfapyridine gives a green precipitate and sulfanilamide gives a blue color or precipitate.)

Loss on drying—Dry about 1 Gm. of Sulfathiazole, accurately weighed, for 4 hours at 100° C.: it loses not more than 0.5 per cent of its weight.

Ash—Sulfathiazole yields not more than 0.1 per cent of ash, page 556.

Clarity and color of solution—A solution of 1 Gm. of Sulfathiazole in a mixture of 20 cc. of distilled water and 5 cc. of sodium hydroxide T.S. is clear and colorless.

Acidity—Digest 2 Gm. of Sulfathiazole with 100 cc. of distilled water at about 70° C. for 5 minutes, cool at once to about 20° C., and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide: not more than 0.5 cc. of the sodium hydroxide is required to produce a pink color.

Chloride—A 25-cc. portion of the filtrate prepared in the test for *acidity* shows no more *chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—Another 25-cc. portion of the filtrate prepared in the test for *acidity* shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Heavy metals—Dissolve 0.5 Gm. of Sulfathiazole in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of distilled water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 586, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 0.5 Gm. of Sulfathiazole, previously dried for 4 hours at 100° C., and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of distilled water, cool to 15° C., add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 0.02553 Gm. of $C_9H_9N_3O_2S_2$.

Storage—Preserve Sulfathiazole in well-closed, light-resistant containers.

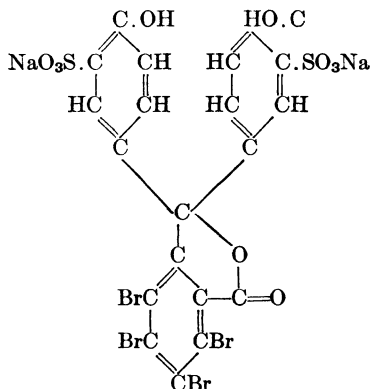
U. S. P. Product of Sulfathiazole—Tabellæ Sulfathiazoli.

AVERAGE DOSE—Metric, 2 Gm.—Apothecaries, 30 grains.

SULFOBROMOPHTHALEINUM SODICUM

Sulfobromophthalein Sodium

Sulfobromophthal. Sod.



$C_{20}H_8Br_4O_{10}S_2Na_2$

Mol. wt. 838.04

Description—Sulfobromophthalein Sodium occurs as a white, crystalline powder. It is odorless and has a bitter taste. It is hygroscopic.

Solubility—Sulfobromophthalein Sodium is soluble in water, but is insoluble in alcohol and in acetone.

Identification—

A: Dissolve 50 mg. of Sulfobromophthalein Sodium in 50 cc. of distilled water, add 1 cc. of this solution to 50 cc. of freshly boiled and cooled distilled water, then add a few drops of sodium hydroxide T.S.: an intense bluish purple color develops.

B: Mix about 0.1 Gm. of Sulfobromophthalein Sodium with 0.5 Gm. of sodium carbonate, and ignite until thoroughly charred. Cool, add 5 cc. of hot water, heat for 5 minutes on a steam bath, and filter: the solution responds to the tests for bromides, page 588.

C: Sulfobromophthalein Sodium responds to the flame test for sodium, page 592.

Loss on drying—Dry about 0.5 Gm. of Sulfobromophthalein Sodium, accurately

weighed, at 100° C. for 3 hours: the loss in weight does not exceed 5 per cent.
Sensitiveness—Dissolve 10 mg. of Sulfobromophthalein Sodium in 10 cc. of distilled water. Add 0.2 cc. of this solution to 50 cc. of freshly boiled and cooled distilled water, then add 0.2 cc. of fiftieth-normal sodium hydroxide: a strong violet color is produced, which is discharged by the addition of 0.2 cc. of fiftieth-normal sulfuric acid.

Color and completeness of solution—A solution of 0.20 Gm. of Sulfobromophthalein Sodium in 10 cc. of distilled water is complete and colorless.

Halide ion—To 5 cc. of an aqueous solution of Sulfobromophthalein Sodium (1 in 100), add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: not more than a slight opalescence is produced.

Sulfate—To 2 cc. of an aqueous solution of Sulfobromophthalein Sodium (1 in 100), add 1 drop of diluted hydrochloric acid, heat to boiling, and add 1 cc. of barium chloride T.S.: the solution remains clear while hot, but on cooling, crystals of a difficultly soluble barium salt of sulfobromophthalein form, which appear under the microscope as groups of platelets. (Barium sulfate is usually amorphous, or it may occur as very small tabular grains.)

Arsenic—Heat a platinum crucible to redness, and add, in small portions, an intimate mixture of 0.2 Gm. of Sulfobromophthalein Sodium, about 0.5 Gm. of potassium nitrate, and about 0.3 Gm. of anhydrous sodium carbonate. Maintain a red heat until the reaction ceases, boil the cooled residue for 5 minutes with 10 cc. of diluted sulfuric acid, filter, and wash the undissolved residue with 10 cc. of distilled water. Evaporate the filtrate and washings until sulfur trioxide vapors are evolved: the residue, dissolved in 5 cc. of distilled water, meets the requirements of the test for *arsenic*, page 554.

Storage—Preserve Sulfobromophthalein Sodium in tight containers.

U. S. P. Product of Sulfobromophthalein Sodium—*Injectio Sulfobromophthaleini Sodici*.

SULFUR PRÆCIPITATUM

Precipitated Sulfur

Sulfur Præc.

S

At. wt. 32.06

Precipitated Sulfur, when dried for 18 hours over sulfuric acid, contains not less than 99.5 per cent of S.

Description—Precipitated Sulfur is a very fine, pale yellow, amorphous or microcrystalline powder, without odor or taste.

Solubility and identification—Precipitated Sulfur has the same *solubilities* and responds to the *identification* test under *Sulfur Sublimatum*, page 446.

Loss on drying—When dried for 18 hours over sulfuric acid, Precipitated Sulfur loses not more than 1 per cent of its weight.

Residue on ignition—Upon ignition Precipitated Sulfur leaves not more than 0.3 per cent of residue.

Acid or alkali—Agitate 2 Gm. of Precipitated Sulfur with 10 cc. of distilled water, and filter: the filtrate is neutral to litmus paper.

Arsenic—Precipitated Sulfur meets the requirements of the test for *arsenic* under *Sulfur Sublimatum*, page 446.

Other forms of sulfur—On shaking 1 Gm. of Precipitated Sulfur with 5 cc. of carbon

disulfide, it dissolves quickly, with the exception of a small amount of insoluble matter, which is usually present.

Assay—Dry Precipitated Sulfur for 18 hours over sulfuric acid, and proceed as directed under *Sulfur Sublimatum*, page 446.

Storage—Preserve Precipitated Sulfur in well-closed containers.

U. S. P. Product of Precipitated Sulfur—Unguentum Sulfuris.

AVERAGE DOSE—Metric, 4 Gm.—Apothecaries, 60 grains.

SULFUR SUBLIMATUM

Sublimed Sulfur

Sulfur Sublim.—Flowers of Sulfur

S

At. wt. 32.06

Sublimed Sulfur, when dried over sulfuric acid for 18 hours, contains not less than 99.5 per cent of S.

Description—Sublimed Sulfur is a fine, yellow, crystalline powder having a faint odor and taste.

Solubility—Sublimed Sulfur is practically insoluble in water, and nearly insoluble in alcohol. One Gm. dissolves slowly and usually incompletely in about 2 cc. of carbon disulfide. One Gm. dissolves in about 100 cc. of olive oil.

Identification—Sublimed Sulfur burns in the air to sulfur dioxide, which can be recognized by its characteristic odor.

Residue on ignition—Upon ignition Sublimed Sulfur leaves not more than 0.5 per cent of residue.

Arsenic—Digest 1 Gm. of Sublimed Sulfur for 3 hours with 10 cc. of ammonia T.S., and filter. Evaporate the clear filtrate to dryness on a water bath, add 1 cc. of nitric acid, and again evaporate to dryness: the residue meets the requirements of the test for *arsenic*, page 554.

Assay—Dry about 1 Gm. of Sublimed Sulfur over sulfuric acid for 18 hours, weigh accurately, and transfer it to a flask containing 50 cc. of a solution of potassium hydroxide in diluted alcohol (1 in 10). Boil the mixture until the liquid is transparent and the Sulfur is dissolved, then dilute it with distilled water to measure exactly 250 cc. Transfer exactly 25 cc. of the solution to a 400-cc. beaker, add 50 cc. of hydrogen peroxide T.S. or more if necessary, to oxidize the sulfur completely, and heat on a water bath for 1 hour. Acidulate the liquid with hydrochloric acid, dilute it with 200 cc. of distilled water, heat to boiling, and add hot barium chloride T.S. in small portions until no further precipitation takes place. Heat on a water bath for 1 hour, then collect the precipitate on a filter, wash, dry, and ignite to constant weight. Perform a blank test using the same quantities of the reagents and in the same manner, and make any necessary correction. The weight of the barium sulfate, multiplied by 0.1373 indicates its equivalent of sulfur.

Storage—Preserve Sublimed Sulfur in well-closed containers.

SUPPOSITORIA

Suppositories

Suppositories are solid bodies of various weights and shapes, adapted for introduction into different orifices of the human body, and melting

or softening at body temperature. The vehicles usually employed are oil of theobroma, glycerinated gelatin, or sodium stearate.

Sizes—The following applies to the use of either oil of theobroma or glycerinated gelatin in suppositories. •

Rectal Suppositories should weigh about 2 Gm. each and should be tapered.

Urethral Suppositories (Bougies) should be pencil-shaped, pointed at one extremity, and either 7 cm. in length, weighing about 2 Gm. each, or 14 cm. in length, weighing about 4 Gm. each.

Vaginal Suppositories should be globular or oviform in shape and should weigh about 5 Gm. each.

Oil of Theobroma Suppositories—For suppositories made with oil of theobroma the following general processes may be employed:

Take of:

THE MEDICINAL SUBSTANCE, the prescribed quantity,
OIL OF THEOBROMA, grated, a sufficient quantity.

Reduce the medicinal substance, if dry, to a very fine powder, or, if an extract, soften it with an appropriate liquid, then mix it thoroughly in a mortar with about an equal weight of grated oil of theobroma, and incorporate the remainder of the oil of theobroma until a homogeneous, plastic mass is obtained, adding, if necessary, a small quantity of expressed oil of almond or wool fat. Roll the mass on a graduated tile until a cylinder of the proper length is formed, divide this into the required number of equal parts, and with a spatula, or other mechanical aid, form them into the desired shape.

If the process of cold compression is preferred, mix the medicinal substance in a suitable mortar with about an equal weight of grated oil of theobroma, as above directed, then thoroughly incorporate it with the remainder of the oil of theobroma, previously finely grated, chilling the mortar, if necessary, to preserve the pulverulent form of the mixture. Transfer the mass to the cylinder of an appropriate suppository compressor, and by the use of this apparatus prepare the desired number of compressed suppositories.

If the process of fusion is preferred, mix the medicinal substance with about an equal weight of grated oil of theobroma, as above directed, then thoroughly incorporate it with the remainder of the oil of theobroma, previously melted by gentle heat on a water bath, in a suitable

vessel provided with a lip. Allow it to cool to about 38° C., and, when the mixture begins to congeal, pour it immediately into suitable well-cooled moulds. Keep the filled moulds at a cold temperature until the suppositories have hardened and are ready to be removed.

For suppositories containing chloral hydrate, phenol, or other substances which soften the vehicle, raise the melting point of the mixture by the addition of a small quantity of spermaceti or other suitable hardening agents. The finished suppositories must melt at body temperature however.

Glycerinated Gelatin Suppositories—For suppositories made with glycerinated gelatin the following process may be used:

Take of:

THE MEDICINAL SUBSTANCE, the prescribed quantity,
GLYCERINATED GELATIN,
GLYCERIN,
DISTILLED WATER, each, a sufficient quantity.

Mix the medicinal substance, if solid and soluble in distilled water or glycerin, or if a miscible liquid, with a little distilled water, and add sufficient glycerin to make the weight of the mixture one-half that of the finished mass. Then thoroughly incorporate it with an equal weight of melted glycerinated gelatin, and pour it at once into suitable moulds which have been greased with a small quantity of white petrolatum. Cool the moulds thoroughly before removing the suppositories. Moulds for urethral suppositories should be warmed sufficiently before pouring the mass to facilitate the proper filling of the mould. Suppositories of a firmer consistence may be prepared by replacing a portion of the distilled water or glycerin with mucilage of acacia.

If the medicinal substance is insoluble in water or glycerin, thoroughly triturate it in a warm mortar with a sufficient quantity of glycerin to make the weight of the mixture one-half that of the finished mass. Then thoroughly incorporate it with an equal weight of melted glycerinated gelatin, and pour into suitable moulds as above directed. With bulky powders about one-half of the glycerin may be replaced with distilled water before trituration.

Glycerinated gelatin suppositories should be protected against the effects of heat, moisture, and dry air by keeping them in tightly-closed containers and in a cool place.

SUPPOSITORIA GLYCERINI

Glycerin Suppositories

Supp. Glycerin.

GLYCERIN.....	92 Gm.
SODIUM STEARATE.....	8 Gm.
DISTILLED WATER.....	5 Gm.

To make about 30 adult rectal suppositories
or 50 infant rectal suppositories.

Heat the glycerin in a porcelain dish, on a water bath, to about 95° C., add the sodium stearate, and stir the mixture gently with a glass rod, maintaining the specified temperature until the sodium stearate is dissolved. Then add the distilled water, mix thoroughly, and immediately pour the hot liquid into suitable moulds. Remove the suppositories when they are completely cold, and preserve them in tightly-stoppered glass containers in a cool place.

NOTE—If preferred, the sodium stearate for Glycerin Suppositories may be prepared during the making of the Suppositories by the direct reaction between stearic acid and sodium bicarbonate, sodium carbonate, or sodium hydroxide, these being taken in correct proportion.

Storage—Preserve Glycerin Suppositories in tight containers, preferably at a temperature not above 25° C.

SYRUPUS

Syrup

Sirup, Simple Syrup

SUCROSE.....	850 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Insert into the neck of a percolator of suitable size a pledget of purified cotton, not too tightly, but in such a manner that the cotton shall nearly fill the neck of the percolator, and moisten it with a few drops of distilled water. Place the sucrose in the percolator, make its surface level without shaking or jarring, then carefully pour upon it 450 cc. of distilled water, and regulate the flow of the liquid, if necessary, so that it will drop rapidly. Collect the percolate in a 1000-cc. graduated container, and if necessary, repass portions of it through the percolator to dissolve all of the sucrose. Then pass enough distilled water through the cotton to make the product measure 1000 cc. Mix thoroughly.

Syrup may also be prepared in the following manner:

Heat 450 cc. of distilled water to boiling, add the sucrose, and continue to heat it cautiously, stirring continuously, until the sucrose is dissolved and the syrup has a temperature of 100° C. Then filter it through purified cotton or other suitable filter, and rinse the container with small portions of hot distilled water, passing the rinsings through the filter until the product measures 1000 cc. when cold. Mix thoroughly.

Specific gravity—The specific gravity of Syrup is about 1.313 at 25° C.

Storage—Preserve Syrup in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS ACIDI CITRICI

Syrup of Citric Acid

Syr. Acid. Cit.

TINCTURE OF LEMON.....	10 cc.
CITRIC ACID.....	10 Gm.
DISTILLED WATER.....	10 cc.
SYRUP, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the citric acid in the distilled water and mix the solution with 950 cc. of syrup. Add the tincture and enough syrup to make the product measure 1000 cc. Mix thoroughly.

This preparation must not be dispensed if it has a terebinthinate odor or taste or shows other indications of deterioration.

Storage—Preserve Syrup of Citric Acid in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS ACIDI HYDRIODICI

Syrup of Hydriodic Acid

Syr. Acid. Hydriod.

Syrup of Hydriodic Acid contains, in each 100 cc., not less than 1.3 Gm. and not more than 1.5 Gm. of HI.

DILUTED HYDRIODIC ACID.....	140 cc.
SUCROSE.....	450 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the diluted hydriodic acid with 550 cc. of distilled water, and dissolve the sucrose in this mixture by agitation. Add sufficient distilled water to make the product measure 1000 cc., and filter.

Description—Syrup of Hydriodic Acid is a transparent, colorless, or not more than pale, straw-colored, syrupy liquid. It is odorless and has a sweet, acidulous taste.

Specific gravity—Syrup of Hydriodic Acid has a specific gravity of about 1.18 at 25° C.

Identification—Mix 5 cc. of Syrup of Hydriodic Acid with a few drops of starch T.S., and add 3 drops of chlorine T.S.: the liquid acquires a deep blue color.

Free iodine—No blue color is produced in Syrup of Hydriodic Acid by starch T.S.

Assay—Place exactly 25 cc. of Syrup of Hydriodic Acid in a flask, dilute it with 100 cc. of distilled water, add 40 cc. of tenth-normal silver nitrate, agitate the mixture, add 5 cc. of nitric acid, and heat on a water bath until the precipitate has acquired a bright yellow color. Cool, add 2 cc. of ferric ammonium sulfate T.S., and determine the residual silver nitrate by titration with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01279 Gm. of HI.

Storage—Preserve in well-closed containers, preferably at a temperature not above 25° C.

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

SYRUPUS AURANTII

Syrup of Orange

Syr. Aurant.

TINCTURE OF SWEET ORANGE PEEL.....	50 cc.
CITRIC ACID.....	5 Gm.
PURIFIED TALC.....	15 Gm.
SUCROSE.....	820 Gm.
DISTILLED WATER, a sufficient quantity,	

To make..... 1000 cc.

Triturate the purified talc with the tincture and citric acid, and gradually add 400 cc. of distilled water. Then filter, returning the first portions of the filtrate until it becomes clear, and wash the mortar and filter with enough distilled water to make the filtrate measure 450 cc. Dissolve the sucrose in this filtrate by agitation, without heating, and add enough distilled water to make the product measure 1000 cc. Mix thoroughly and strain.

This preparation must not be dispensed if it has a terebinthinate odor or taste or shows other indications of deterioration.

Alcohol content—From 2 to 5 per cent, by volume, of C_2H_5OH .

Storage—Preserve Syrup of Orange in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS AURANTII FLORUM

Syrup of Orange Flowers

Syr. Aurant. Flor.

ORANGE FLOWER WATER.....	225 cc.
SUCROSE.....	850 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the orange flower water with 225 cc. of distilled water, dissolve the sucrose in the mixture by agitation without heating, and add sufficient distilled water to make the product measure 1000 cc. Mix thoroughly and strain.

Syrup of Orange Flowers may also be made in the following manner:

Prepare a percolator in the manner described under *Syrupus*, page 449. Pour the mixture of orange flower water and distilled water upon the sucrose, and, when all of the liquid has run through, return portions of the percolate, if necessary, to dissolve all of the sucrose. Then pass enough distilled water through the cotton to make the product measure 1000 cc. Mix thoroughly.

Storage—Preserve Syrup of Orange Flowers in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS BALSAMI TOLUTANI

Syrup of Tolu Balsam

Syr. Balsam. Tolu.—Syrup of Tolu

TINCTURE OF TOLU BALSAM.....	50 cc.
MAGNESIUM CARBONATE.....	10 Gm.
SUCROSE.....	820 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the tincture intimately with the magnesium carbonate and 60 Gm. of sucrose in a mortar. Gradually add 430 cc. of distilled water with trituration, and filter. Dissolve the remainder of the sucrose in the clear filtrate with gentle heating, strain the syrup while warm, and add

sufficient distilled water through the strainer to make the product measure 1000 cc. Mix thoroughly.

Syrup of Tolu Balsam may also be made in the following manner:

Prepare a percolator as described under *Syrupus*, page 449. Pour the filtrate obtained as directed in the formula above, upon the remainder of the sucrose contained in the percolator, and when all of the liquid has run through, return portions of the percolate, if necessary, to dissolve all of the sucrose. Then pass enough distilled water through the cotton to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 2 to 4 per cent, by volume, of C_2H_5OH .

Storage—Preserve Syrup of Tolu Balsam in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS GLYCYRRHIZÆ

Syrup of Glycyrrhiza

Syr. Glycyrrh.—Syrup of Licorice

FLUIDEXTRACT OF GLYCYRRHIZA.....	250	cc.
OIL OF FENNEL.....	0.05	cc.
OIL OF ANISE.....	0.5	cc.
SYRUP, a sufficient quantity,		
To make.....	1000	cc.

Add the oils to the fluidextract and agitate until thoroughly mixed. Then add sufficient syrup to make the product measure 1000 cc. and mix well.

Alcohol content—From 5 to 6 per cent, by volume, of C_2H_5OH .

Storage—Preserve Syrup of Glycyrrhiza in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS IPECACUANHÆ

Syrup of Ipecac

Syr. Ipecac.

FLUIDEXTRACT OF IPECAC.....	70	cc.
GLYCERIN.....	100	cc.
SYRUP, a sufficient quantity,		
To make.....	1000	cc.

Mix the fluidextract with the glycerin, and add enough syrup to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 1 to 2.5 per cent, by volume, of C_2H_5OH .

Storage—Preserve Syrup of Ipecac in well-closed containers, preferably at a temperature not above $25^{\circ} C$.

AVERAGE DOSE—Emetic, Metric, 8 cc.—Apothecaries, 2 fluidrachms.

SYRUPUS PICIS PINI

Syrup of Pine Tar

Syr. Pic. Pin.—Syrupus Picis Liquidæ, Syrup of Tar

RECTIFIED OIL OF TAR.....	1 cc.
SUCROSE.....	850 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Mix the oil with 450 cc. of distilled water, and agitate the mixture frequently during 15 minutes. Then set it aside for 24 hours, shaking it occasionally during that time. Filter, dissolve the sucrose in the clear filtrate without heating, and add sufficient distilled water to make the product measure 1000 cc. Mix thoroughly and strain.

Storage—Preserve Syrup of Pine Tar in well-closed containers, preferably at a temperature not above $25^{\circ} C$.

AVERAGE DOSE—Metric, 10 cc.—Apothecaries, $2\frac{1}{2}$ fluidrachms.

SYRUPUS PRUNI VIRGINIANÆ

Syrup of Wild Cherry

Syr. Prun. Virg.

WILD CHERRY, in coarse powder.....	150 Gm.
GLYCERIN.....	150 cc.
SUCROSE.....	675 Gm.
ALCOHOL.....	20 cc.
DISTILLED WATER, a sufficient quantity,	
To make.....	1000 cc.

Moisten the wild cherry with 100 cc. of water, pack in a cylindrical percolator, and pour sufficient water upon it to saturate the powder and leave a water stratum above it. Close the lower orifice, cover the percolator, and macerate the drug for 1 hour. Then allow the percolation to proceed rapidly, and collect 400 cc. of percolate, using additional distilled water as the menstruum. Filter the percolate, if necessary, add the sucrose and dissolve it by agitation, then add the glycerin, the alcohol, and sufficient distilled water to make the finished product measure 1000 cc. Strain the Syrup if necessary.

Syrup of Wild Cherry may also be made in the following manner:

Prepare a second percolator as described under *Syrupus*, page 449, place the sucrose in this percolator, arrange it below the percolator containing the drug, and after the drug has macerated, allow the percolate to drop on the sucrose, and collect the syrup in a bottle which has been graduated to 1000 cc., and in which the alcohol and glycerin have been placed. Add distilled water to the drug, as necessary, to make the finished Syrup measure 1000 cc.

Alcohol content—From 1 to 2 per cent, by volume, of C_2H_5OH .

Storage—Preserve Syrup of Wild Cherry in well-closed containers, preferably at a temperature not above $25^{\circ}C$.

SYRUPUS RHEI AROMATICUS

Aromatic Syrup of Rhubarb

Syr. Rhei Arom.

AROMATIC TINCTURE OF RHUBARB.....	150 cc.
POTASSIUM CARBONATE.....	1 Gm.
SYRUP, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the potassium carbonate in the tincture, and add to the mixture enough syrup to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 6 to 7 per cent, by volume, of C_2H_5OH .

Storage—Preserve Aromatic Syrup of Rhubarb in well-closed containers, preferably at a temperature not exceeding $25^{\circ}C$.

AVERAGE DOSE—Metric, 10 cc.—Apothecaries, $2\frac{1}{2}$ fluidrachms.

SYRUPUS SARSAPARILLÆ COMPOSITUS

Compound Syrup of Sarsaparilla

Syr. Sarsap. Co.

FLUIDEXTRACT OF SARSAPARILLA.....	200 cc.
FLUIDEXTRACT OF GLYCYRRHIZA.....	15 cc.
OIL OF SASSAFRAS.....	0.2 cc.
OIL OF ANISE.....	0.2 cc.
METHYL SALICYLATE.....	0.2 cc.
ALCOHOL.....	19.4 cc.
SYRUP.....	<u>765 cc.</u>
To make about.....	1000 cc.

Mix the fluidextracts and add the alcohol, in which the methyl salicylate and the oils have been dissolved. Gradually add this solution to the syrup, and mix thoroughly.

Alcohol content—From 8.5 to 11 per cent, by volume, of C_2H_5OH .

Storage—Preserve Compound Syrup of Sarsaparilla in well-closed containers, preferably at a temperature not above 25° C.

SYRUPUS SENNÆ

Syrup of Senna

Syr. Senn.

FLUIDEXTRACT OF SENNA.....	250 cc.
OIL OF CORIANDER.....	5 cc.
SUCROSE.....	635 Gm.
DISTILLED WATER, a sufficient quantity,	
To make.....	<u>1000 cc.</u>

Mix the oil of coriander with the fluidextract, and gradually add 330 cc. of distilled water. Allow the mixture to stand for 24 hours in a cool place, with occasional agitation, then filter, and pass enough distilled water through the filter to obtain 580 cc. of filtrate. Dissolve the sucrose in this liquid, and add sufficient distilled water to make the product measure 1000 cc. Mix well and strain.

Alcohol content—From 5 to 7 per cent, by volume, of C_2H_5OH .

Storage—Preserve Syrup of Senna in well-closed containers, preferably at a temperature not above 25° C.

AVERAGE DOSE—Metric, 8 cc.—Apothecaries, 2 fluidrachms.

TABELLÆ ACETOPHENETIDINI

Acetophenetidin Tablets

Tab. Acetphen.—Phenacetin Tablets

Acetophenetidin Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of acetophenetidin ($C_{10}H_{13}NO_2$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Acetophenetidin Tablets, equivalent to about 0.5 Gm. of acetophenetidin, with two 5-cc. portions of ether, and discard the ether. Macerate the residue with 20 cc. of alcohol for 30 minutes, then filter, evaporate the filtrate to dryness on a steam bath, and dry the residue at about 80° C. The acetophenetidin so obtained responds to the *identification tests* under *Acetophenetidinum*, page 11, and when recrystallized from hot water and dried at 80° C., it melts between 134° and 136° C.

Acetanilid—Boil 0.2 Gm. of the acetophenetidin obtained in the assay with 5 cc. of distilled water for 1 minute, cool, and filter. Add to the filtrate bromine T.S., drop by drop, agitating after each addition until the solution remains permanently yellow: not more than a slight turbidity results.

Assay—Weigh a counted number of not less than 20 Acetophenetidin Tablets and reduce them to a fine powder without appreciable loss. Digest an accurately weighed portion of the powder, equivalent to about 0.3 Gm. of acetophenetidin, with two 10-cc. portions of purified benzin for 10 minutes and decant each time through a small filter paper moistened with purified benzin. Discard the benzin extracts. Macerate the residue with 20 cc. of chloroform during 30 minutes with frequent agitation, then decant the liquid through the same filter as the purified benzin into a tared beaker. Again macerate the residue with 15 cc. of chloroform for 20 minutes and filter through the same filter. Wash the vessel in which the maceration was made and the filter with several 5-cc. portions of warm chloroform until the acetophenetidin is completely extracted. Evaporate the combined chloroform extract with the aid of a current of dry air and dry the residue to constant weight at about 60° C.

Storage—Preserve Acetophenetidin Tablets in well-closed containers.

Sizes—Acetophenetidin Tablets usually available contain the following amounts of acetophenetidin: 0.12, 0.2, and 0.3 Gm. (2, 3, and 5 grains).

AVERAGE DOSE OF ACETOPHENETIDIN—Metric, 0.3 Gm.—
Apothecaries, 5 grains.

TABELLÆ ACIDI ACETYLSALICYLICI

Acetylsalicylic Acid Tablets

Tab. Acid. Acetylsal.—Aspirin Tablets

Acetylsalicylic Acid Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of acetylsalicylic acid ($C_9H_8O_4$), including all tolerances (see page 2).

Identification—

A: Crush an Acetylsalicylic Acid Tablet, boil it with 50 cc. of distilled water for 5 minutes, cool, and add 1 or 2 drops of ferric chloride T.S.: a violet red color is produced.

B: Digest a quantity of finely powdered Acetylsalicylic Acid Tablets, equivalent to about 0.5 Gm. of acetylsalicylic acid, with 10 cc. of sodium carbonate T.S. for 5 minutes, and filter. Boil the filtrate for 1 or 2 minutes, cool, and add

an excess of diluted sulfuric acid: a white precipitate of salicylic acid is produced and the odor of acetic acid is perceptible. Filter the mixture when cold, add 3 cc. of alcohol and 3 cc. of sulfuric acid to the filtrate, and warm the mixture: the odor of ethyl acetate becomes noticeable.

Assay—Weigh a counted number of not less than 20 Acetylsalicylic Acid Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.5 Gm. of acetylsalicylic acid, transfer it completely to an Erlenmeyer flask with the aid of 20 cc. of neutralized alcohol, previously cooled to from 15° to 20° C., and titrate the solution immediately with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Now add to the titrated solution a volume of tenth-normal sodium hydroxide equal to that used in the titration, plus 15 cc. more. Heat the mixture in a bath of boiling water for 15 minutes with frequent agitation. Remove the flask from the water bath, cool it quickly to room temperature, then titrate with tenth-normal sulfuric acid. Subtract the number of cc. of tenth-normal sulfuric acid used from the number of cc. of tenth-normal sodium hydroxide added the second time, and multiply the difference by 0.01802. The result represents the weight of acetylsalicylic acid present in the portion of the Tablets used for the assay. Check the normality of the tenth-normal sodium hydroxide against the tenth-normal sulfuric acid by titrating the same volume of the sodium hydroxide as used in the second addition and in the presence of the same volume of neutralized alcohol, adding sufficient distilled water to make the same volume of liquid, and heating for the same length of time and in the same manner as described above.

Storage—Preserve Acetylsalicylic Acid Tablets in well-closed containers.

Sizes—Acetylsalicylic Acid Tablets usually available contain the following amounts of Acetylsalicylic acid: 60 mg. and 0.3 Gm. (1 and 5 grains).

AVERAGE DOSE OF ACETYSALICYLIC ACID—Metric, 0.3 Gm.—
Apothecaries, 5 grains.

TABELLÆ ACIDI ASCORBICI

Ascorbic Acid Tablets

Tab. Acid. Ascorb.—Vitamin C Tablets

Ascorbic Acid Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of ascorbic acid ($C_6H_8O_6$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Ascorbic Acid Tablets with sufficient diluted alcohol to make approximately the equivalent of ascorbic acid 1 in 50, and filter. This filtrate responds to *identification tests B and C* under *Acidum Ascorbicum*, page 16.

Assay—Weigh a counted number of not less than 20 Ascorbic Acid Tablets, and reduce them to a powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 0.2 Gm. of ascorbic acid, and dissolve it in a mixture of 50 cc. of recently boiled and cooled distilled water and 15 cc. of diluted sulfuric acid, and titrate the solution at once with tenth-normal iodine, adding a few drops of starch T.S. as the end-point is near. Each cc. of tenth-normal iodine is equivalent to 0.008806 Gm. of $C_6H_8O_6$.

Storage—Preserve Ascorbic Acid Tablets in tight containers.

Sizes—Ascorbic Acid Tablets usually available contain the following amounts of Ascorbic Acid: 25, 50, and 100 mg. ($\frac{3}{8}$, $\frac{3}{4}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF ASCORBIC ACID—Metric, 50 mg.—Apothecaries, $\frac{3}{4}$ grain.

TABELLÆ ACIDI NICOTINICI

Nicotinic Acid Tablets

Tab. Acid. Nicotin.—Niacin Tablets

Nicotinic Acid Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of nicotinic acid ($C_6H_5O_2N$), including all tolerances (see page 2).

Identification—Boil a quantity of powdered Nicotinic Acid Tablets, equivalent to about 0.5 Gm. of nicotinic acid, with 25 cc. of alcohol for a few minutes, filter, and wash the residue with 10 cc. of hot alcohol. Add to the filtrate 30 cc. of distilled water, and evaporate to about 25 cc. on a steam bath. Cool, filter if insoluble matter separates, and evaporate the filtrate to about 10 cc. Cool, and place in a refrigerator for 1 hour. Filter the separated nicotinic acid with suction, wash it with a few cc. of cold alcohol, and dry at $100^\circ C$. The nicotinic acid so obtained melts between 234° and $237^\circ C$. It also responds to *identification tests A and B* under *Acidum Nicotinicum*, page 25.

Assay—Weigh a counted number of not less than 20 Nicotinic Acid Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.3 Gm. of nicotinic acid, and gently reflux it with 40 cc. of neutralized alcohol for 10 minutes. Decant the hot alcohol through a small filter, and re-extract the residue three times in a similar manner, using 15 cc. of neutralized alcohol each time. Dilute the combined alcohol filtrates with 50 cc. of distilled water, and evaporate to about 50 cc. Cool, add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.01231 Gm. of $C_6H_5O_2N$.

Storage—Preserve Nicotinic Acid Tablets in well-closed containers.

Sizes—Nicotinic Acid Tablets usually available contain the following amounts of nicotinic acid: 25, 50 and 100 mg. ($\frac{3}{8}$, $\frac{3}{4}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF NICOTINIC ACID—Metric, 25 mg.—Apothecaries, $\frac{3}{8}$ grain.

TABELLÆ ATROPINÆ SULFATIS

Atropine Sulfate Tablets

Tab. Atrop. Sulf.

Atropine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of atropine sulfate $[(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4 \cdot H_2O]$ for tablets of 20 mg. or more; and not less than 90 per cent and not more than 110 per cent of the labeled amount for tablets of less than 20 mg., including all tolerances (see page 2).

Identification—

- A: Dissolve a portion of powdered Atropine Sulfate Tablets equivalent to about 1 mg. of atropine sulfate in 10 cc. of distilled water, and filter the solution. Instil 1 drop of this solution into the eye of a cat or other animal: the pupil shows noticeable dilation within 2 hours.
- B: A filtered aqueous solution of Atropine Sulfate Tablets responds to the tests for sulfate, page 592.

Assay—Weigh a counted number of not less than 20 Atropine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 60 mg. of atropine sulfate, and transfer it completely to a 100-cc. volumetric flask. Add 40 cc. of distilled water and 5 cc. of diluted sulfuric acid, shake the mixture occasionally during 2 hours, and allow to stand over night. Add distilled water to the 100-cc. mark, mix thoroughly, and filter through a filtering crucible or through a sintered glass crucible. Transfer to a separator an accurately measured portion of the filtrate equivalent to about 40 mg. of atropine sulfate, make the solution distinctly alkaline with ammonia T.S., and completely extract the alkaloids with small, successive portions of chloroform. Combine the chloroform extracts, and for each 50 cc. of the chloroform add 10 cc. of neutral alcohol, and evaporate the mixture to dryness on a steam bath, but do not prolong the heating after the residue has become dry. Dissolve the residue in 3 cc. of neutral alcohol, and add exactly 20 cc. of fiftieth-normal sulfuric acid. Heat gently to expel any chloroform, cool, then titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.006948 Gm. of $(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4 \cdot H_2O$.

NOTE—This assay is applicable to uncoated Tablets. For coated Tablets, a suitable modification of this assay or another suitable assay method may be necessary.

Storage—Preserve Atropine Sulfate Tablets in well-closed containers.

Sizes—Atropine Sulfate Tablets usually available contain the following amounts of atropine sulfate: 0.12, 0.3, 0.4, 0.5, 0.6, and 1.2 mg. ($\frac{1}{500}$, $\frac{1}{200}$, $\frac{1}{150}$, $\frac{1}{120}$, $\frac{1}{100}$ and $\frac{1}{50}$ grain).

AVERAGE DOSE OF ATROPINE SULFATE—Metric, 0.5 mg.—
Apothecaries, $\frac{1}{120}$ grain.

TABELLÆ BARBITALI

Barbital Tablets

Tab. Barbital.

Barbital Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of barbital ($C_8H_{12}N_2O_3$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Barbital Tablets, equivalent to about 0.5 Gm. of barbital, with 10 cc. of purified benzin, then decant the liquid as completely as possible. Again treat the residue in the same manner with 5 cc. of purified benzin. Macerate the residue with 15 cc. of alcohol for 30 minutes, filter, evaporate the filtrate to dryness on a steam bath, and dry the residue to about 80° C.: the barbital so obtained melts between 188° and 192° C., and responds to *identification tests A and B* under *Barbitalum*, page 78.

Assay—Weigh a counted number of not less than 20 Barbital Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.3 Gm. of barbital, transfer it completely to a separator, and dissolve it as far as possible in 10 cc. of alkaline sodium chloride solution,

made by saturating an aqueous solution of sodium hydroxide (1 in 50) with sodium chloride. Extract the solution with two 15-cc. portions of ether, and discard the ether. Add 2 cc. of hydrochloric acid and 5 cc. of distilled water, and completely extract the barbital with a solvent composed of 2 volumes of alcohol, 1 volume of ether, and 7 volumes of chloroform. Wash the extract with 5 cc. of distilled water acidified with a drop of hydrochloric acid, extract the aqueous washing with two 5-cc. portions of ether, and add these to the solvent extract. Filter the combined extracts through a pledget of cotton or other suitable filter into a tared beaker, and wash the separator and the filter with several small portions of the solvent. Evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, dry the residue of barbital at 100° C. for 2 hours, cool, and weigh.

Storage—Preserve Barbital Tablets in well-closed containers.

Sizes—Barbital Tablets usually available contain the following amount of barbital: 0.3 Gm. (5 grains).

AVERAGE DOSE OF BARBITAL—Metric, 0.3 Gm.—Apothecaries, 5 grains.

TABELLÆ BARBITALI SODICI

Barbital Sodium Tablets

Tab. Barbital. Sod.—Soluble Barbital Tablets

Barbital Sodium Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of barbital sodium ($C_8H_{11}N_2O_3Na$), including all tolerances (see page 2).

Identification—

A: Digest a quantity of finely powdered Barbital Sodium Tablets equal to about 1 Gm. of soluble barbital with 10 cc. of distilled water, and filter if necessary. Add to the filtrate 3 cc. of diluted hydrochloric acid: a white precipitate of barbital is produced. Collect the precipitate on a filter, wash it with cold distilled water until the washings are practically free from chloride, then dry at 80° C. The barbital so obtained melts between 188° and 192° C. and responds to *identification tests A and B* under *Barbitalum*, page 78.

B: An aqueous solution of the Tablets responds to the flame test for sodium, page 592.

Assay—Weigh a counted number of not less than 20 Barbital Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.3 Gm. of barbital sodium, transfer it completely to a separator, and proceed as directed in the assay under *Tæbellæ Barbitali*, page 460, beginning with “and dissolve it as far as possible.” The weight of the barbital so obtained, multiplied by 1.119, represents the weight of barbital sodium in the portion of the Tablets taken for the assay.

Storage—Preserve Barbital Sodium Tablets in well-closed containers.

Sizes—Barbital Sodium Tablets usually available contain the following amount of barbital sodium: 0.3 Gm. (5 grains).

AVERAGE DOSE OF BARBITAL SODIUM—Metric, 0.3 Gm.—Apothecaries, 5 grains.

TABELLÆ CASCARÆ SAGRADÆ

Cascara Sagrada Tablets

Tab. Casc. Sagr.—Extract of Cascara Sagrada Tablets

Cascara Sagrada Tablets are prepared from extract of cascara sagrada.

Storage—Preserve Cascara Sagrada Tablets in well-closed containers.

Sizes—Cascara Sagrada Tablets usually available contain the following amounts of extract of cascara sagrada: 0.12, 0.2, and 0.3 Gm. (2, 3, and 5 grains).

AVERAGE DOSE OF EXTRACT OF CASCARA SAGRADA—Metric,
0.3 Gm.—Apothecaries, 5 grains.

TABELLÆ CHINIOFONI

Chiniofon Tablets

Tab. Chiniofon.

Chiniofon Tablets contain an amount of iodine (I) corresponding to not less than 26.0 per cent and to not more than 29.0 per cent of the labeled amount of chiniofon, including all tolerances (see page 2).

Identification—Powder a number of Chiniofon Tablets, equivalent to about 0.5 Gm. of chiniofon, macerate the powder for 15 minutes with 30 cc. of water, and filter. The filtrate responds to the *identification tests* under *Chiniofonum*, page 126.

Inorganic iodine—To 10 cc. of the filtrate from the identification test add 1 cc. of hydrochloric acid, filter, and add to the filtrate 2 cc. of chloroform and a few drops of ferric chloride T.S., and shake the mixture: the chloroform is not colored violet or pink.

Assay—Weigh a counted number of not less than 20 Chiniofon Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.4 Gm. of chiniofon, and place it in a 500-cc. Erlenmeyer flask. Add 20 cc. of aqueous sodium hydroxide (1 in 20), and warm on a steam bath until no more dissolves. Add several pieces of porcelain, and follow with 25 cc. of potassium permanganate solution (1 in 15). Rinse the inner wall of the flask with a small volume of distilled water, place a short-stem funnel in the flask, and heat the mixture on the steam bath for 1 hour, rotating the flask at 5-minute intervals. Add to the contents of the flask 75 cc. of distilled water, and cool in an ice bath. Then add all at once, while rotating the flask, 15 cc. of an aqueous solution of sodium bisulfite (1 in 5), follow with 20 cc. of diluted sulfuric acid, and replace in an ice bath. Add, dropwise, a solution of potassium permanganate (1 in 10) until a slight yellow or pink color is produced which persists for a few seconds, then add at once, dropwise, just sufficient sodium bisulfite solution to discharge the permanganate color. Filter the solution, if necessary, and wash the insoluble residue with a small portion of distilled water. Now add to the solution 2 cc. of glacial acetic acid, 1.0 Gm. of dextrin, 1 Gm. of freshly powdered ammonium carbonate, and 0.5 cc. of diiodofluorescein T.S., and titrate the solution in diffused light with tenth-normal silver nitrate until the color of the solu-

tion just changes from pale yellow to pink. Each cc. of tenth-normal silver nitrate is equivalent to 0.01269 Gm. of iodine (I).

Storage—Preserve Chiniofon Tablets in tight containers.

Sizes—Chiniofon Tablets usually available contain the following amount of chiniofon: 0.25 Gm. (4 grains).

AVERAGE DOSE OF CHINIOFON—Metric, 1 Gm.—Apothecaries, 15 grains.

TABELLÆ CODEINÆ PHOSPHATIS

Codeine Phosphate Tablets

Tab. Codein. Phos.

Codeine Phosphate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of codeine phosphate ($C_{18}H_{21}O_3N.H_3PO_4.1\frac{1}{2}H_2O$), including all tolerances (see page 2).

Identification—

A: Digest a quantity of finely powdered Codeine Phosphate Tablets, equivalent to about 50 mg. of codeine phosphate, with 15 cc. of distilled water and 5 cc. of diluted sulfuric acid for 1 hour. Filter, if necessary, and wash any undissolved residue with a few cc. of distilled water. Render the filtrate alkaline with ammonia T.S., extract with several small portions of chloroform, and evaporate the chloroform solution to dryness on a steam bath. The resulting residue of codeine responds to *identification tests A and B* under *Codeina*, page 139.

B: Prepare about 10 cc. of a filtered aqueous solution of Codeine Phosphate Tablets corresponding to codeine phosphate, 1 in 75. Neutralize 5 cc. of the solution with diluted ammonia T.S., and add silver nitrate T.S.: a yellow precipitate of silver phosphate is produced which is soluble in diluted nitric acid and in ammonia T.S.

Morphine—A 1-cc. portion of the solution from the preceding test meets the requirements of the test for *morphine* described under *Codeina*, page 139.

Assay—Weigh a counted number of not less than 20 Codeine Phosphate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.15 Gm. of codeine phosphate, and transfer it completely to a 100-cc. volumetric flask. Add sufficient distilled water to make a thin suspension, then add 20 cc. of half-normal sulfuric acid, shake the mixture occasionally during 2 hours, and allow it to stand over night. Add distilled water to the 100-cc. mark, mix well, and filter through a filtering crucible. Transfer to a separator an accurately measured portion of the filtrate, equivalent to not less than 75 mg. of codeine phosphate, render the solution alkaline with ammonia T.S., and completely extract the alkaloid with small, successive portions of chloroform. Evaporate the combined chloroform solution nearly to dryness on a steam bath, add exactly 30 cc. of fiftieth-normal sulfuric acid, and heat gently to dissolve the codeine and expel all of the chloroform. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.008488 Gm. of $C_{18}H_{21}O_3N.H_3PO_4.1\frac{1}{2}H_2O$.

Storage—Preserve Codeine Phosphate Tablets in well-closed containers.

Sizes—Codeine Phosphate Tablets usually available contain the following amounts of codeine phosphate: 15, 30, and 60 mg. ($\frac{1}{4}$, $\frac{1}{2}$ and 1 grain).

AVERAGE DOSE OF CODEINE PHOSPHATE—Metric, 30 mg.—
Apothecaries, $\frac{1}{2}$ grain.

TABELLÆ CODEINÆ SULFATIS

Codeine Sulfate Tablets

Tab. Codein. Sulf.

Codeine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of codeine sulfate $[(C_{18}H_{21}O_3N)_2 \cdot H_2SO_4 \cdot 5H_2O]$, including all tolerances (see page 2).

Identification—

A: The residue of codeine obtained as directed in *identification test A* under *Tabellæ Codeinæ Phosphatis* responds to *identification tests A* and *B* under *Codeina*, page 139.

B: A filtered, aqueous solution of Codeine Sulphate Tablets responds to the tests for sulfate, page 592.

Morphine—A 1-cc. portion of the solution from the preceding test meets the requirements of the test for *morphine* under *Codeina*, page 139.

Assay—Proceed as directed under the assay for *Tabellæ Codeinæ Phosphatis*, page 463.

Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.007869 Gm. of $(C_{18}H_{21}O_3N)_2 \cdot H_2SO_4 \cdot 5H_2O$.

Storage—Preserve Codeine Sulfate Tablets in well-closed containers.

Sizes—Codeine Sulfate Tablets usually available contain the following amounts of codeine sulfate: 15, 30, and 60 mg. ($\frac{1}{4}$, $\frac{1}{2}$, and 1 grain).

AVERAGE DOSE OF CODEINE SULFATE—Metric, 30 mg.—
Apothecaries, $\frac{1}{2}$ grain.

TABELLÆ COLCHICINÆ

Colchicine Tablets

Tab. Colchicin.

Colchicine Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of colchicine ($C_{22}H_{25}NO_6$), including all tolerances (see page 2).

Identification—The colchicine obtained in the assay melts at about 140° C. and responds to *identification tests B* and *C* under *Colchicina*, page 143.

Assay—Weigh a counted number of not less than 20 Colchicine Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 50 mg. of colchicine, and macerate it in a flask with 10 cc. of purified benzin for 5 minutes, and decant the liquid through a small filter paper, retaining as much as possible of the powder in the flask. Repeat the maceration three times with 10-cc. portions of purified benzin in the manner just described. Discard the benzin extracts. Now add to the flask 20 cc. of alcohol, and heat gently on a steam bath under a reflux condenser for 10 minutes. Decant the alcohol solution through the same filter as used with the purified benzin, and repeat the extraction with another portion of 20 cc. of alcohol in the same manner. Transfer the residue to the filter with the aid of hot alcohol, and wash the flask and the filter with small portions of hot alcohol until the washings are colorless. Evaporate the combined alcohol extract to dryness on a steam bath. Add to the residue 15 cc. of chloroform, and heat gently until no more dissolves. Filter into a tared flask, wash the beaker and filter with chloroform until the washings are colorless, and carefully evaporate the chloroform to dryness on a steam bath.

Add to the residue 2 cc. of alcohol, and evaporate to dryness on a steam bath. Re-evaporate with 2 cc. of alcohol, and dry to constant weight at 100° C.

Storage—Preserve Colchicine Tablets in well-closed containers.

Sizes—Colchicine Tablets usually available contain the following amount of Colchicine: 0.5 mg. ($\frac{1}{120}$ grain).

AVERAGE DOSE OF COLCHICINE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

TABELLÆ DIGITALIS

Digitalis Tablets

Tab. Digit.

Digitalis Tablets contain an amount of powdered digitalis corresponding in potency to not less than 95 per cent and not more than 105 per cent of the labeled amount of powdered digitalis.

Assay—Triturate a counted number, not less than 20, of the Tablets in a glass mortar with the aid of a sufficient amount of menstruum consisting of 4 parts of alcohol, by volume, and 1 part of distilled water, by volume, until the Tablets have completely disintegrated. Transfer quantitatively with the aid of more of the menstruum to a hard-glass, glass-stoppered container of at least 50-cc. capacity. Add sufficient of the prescribed menstruum so that the total volume of menstruum corresponds to 1 cc. for each expected U. S. P. Digitalis Unit. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 $\pm$ 2 hours at 25° C. $\pm$ 5° by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter transfer to a centrifuge tube, centrifuge the mixture, and decant into a dry, hard-glass bottle having a tight closure. Preserve under refrigeration until used. Do not use for assay after a period of more than 30 days. Assay as directed under *Tinctura Digitalis*, page 510.

Storage—Preserve Digitalis Tablets in tight containers.

Sizes—Digitalis Tablets usually available contain the following amounts of digitalis: 50 and 100 mg. ($\frac{3}{4}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF POWDERED DIGITALIS—Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

TABELLÆ DIHYDROMORPHINONI HYDROCHLORIDI

Dihydromorphinone Hydrochloride Tablets

Tab. Dihydromorph. Hydrochlor.

Dihydromorphinone Hydrochloride Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of dihydromorphinone hydrochloride ($C_{17}H_{19}O_3N.HCl$), including all tolerances (see page 2).

Identification—

A: Dissolve a quantity of Dihydromorphinone Hydrochloride Tablets, equivalent to about 0.1 Gm. of dihydromorphinone hydrochloride, in 10 cc. of distilled water, and filter if necessary. Precipitate the base as described in *identification test A* under *Dihydromorphinoni Hydrochloridum*, using proportionate quantities of the reagent. The melting point of the base so obtained is about 260° C. A 10-mg. portion of the base dissolved in 1 drop of diluted hydrochloric acid and 1 cc. of distilled water responds to *identification test C* under *Dihydromorphinoni Hydrochloridum*, page 152.

B: The filtrate obtained from the precipitation of the base, when acidulated with nitric acid, responds to the silver nitrate test for chloride, page 589.

Assay—Weigh a counted number of not less than 20 Dihydromorphinone Hydrochloride Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 70 mg. of dihydromorphinone hydrochloride, and transfer it completely to a separator with the aid of 10 cc. of distilled water. Add 10 cc. of a cold saturated solution of sodium bicarbonate, and extract at first with 30-cc., then with 20-cc. portions of chloroform until the alkaloid is completely extracted. Wash the combined chloroform extracts with 10 cc. of water, filter the chloroform through a filter moistened with chloroform, and wash the separator and filter twice with 5-cc. portions of chloroform. Evaporate the chloroform nearly to dryness on a steam bath with the aid of a current of air, add to the residue exactly 25 cc. of fiftieth-normal sulfuric acid and 5 cc. of distilled water, and heat gently to expel any remaining chloroform. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.006436 Gm. of $C_{17}H_{19}O_3N \cdot HCl$.

Storage—Preserve Dihydromorphinone Hydrochloride Tablets in well-closed containers.

Sizes—Dihydromorphinone Hydrochloride Tablets usually available contain the following amounts of dihydromorphinone hydrochloride: 1, 2, and 4 mg. ($\frac{1}{30}$, $\frac{1}{30}$, and $\frac{1}{15}$ grain).

AVERAGE DOSE OF DIHYDROMORPHINONE HYDROCHLORIDE—

Metric, 2 mg.—Apothecaries, $\frac{1}{30}$ grain.

TABELLÆ EPHEDRINÆ SULFATIS**Ephedrine Sulfate Tablets****Tab. Ephed. Sulf.**

Ephedrine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of ephedrine sulfate ($C_{10}H_{15}NO$)₂·H₂SO₄, including all tolerances (see page 2).

Identification—

A: Triturate a quantity of finely powdered Ephedrine Sulfate Tablets, equivalent to about 0.2 Gm. of ephedrine sulfate, with two 5-cc. portions of chloroform, and discard the chloroform. Macerate the residue with 15 cc. of warm alcohol for 20 minutes, filter, and evaporate the filtrate to dryness on a steam bath. The residue of ephedrine sulfate so obtained responds to *identification tests A* and *B* under *Ephedrinæ Sulfas*, page 164.

B: A filtered aqueous solution of the Tablets responds to the tests for sulfate, page 592.

Assay—Weigh a counted number of not less than 20 Ephedrine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.1 Gm. of ephedrine sulfate, and macerate it with 10 cc. of distilled water and 1 cc. of normal sulfuric acid for 2

hours. Decant the liquid through a small filter into a beaker. Macerate the residue with 5 cc. of distilled water for 20 minutes, filter through the same filter, and wash the residue and filter with small portions of distilled water. Evaporate the combined filtrate and washings to about 7 cc., and transfer the solution completely to a separator with the aid of a few cc. of distilled water. Saturate the solution with sodium chloride, then add 5 cc. of normal sodium hydroxide, and extract with 25 cc. of ether. Draw off the aqueous layer into another separator, and repeat the extraction of the aqueous layer in a similar manner several times, using 20 cc. of ether each time until the alkaloid is completely extracted. Wash the combined ether extracts with two 5-cc. portions of distilled water, then extract the water with 10 cc. of ether, and add this ether to the main ether extract. Evaporate the combined ether extracts at a temperature not exceeding 30° C. to about 10 cc., add exactly 40 cc. of fiftieth-normal sulfuric acid, and heat gently on a steam bath to dissolve all of the alkaloid and dispel the remainder of the ether. Cool, and titrate the excess of sulfuric acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.004285 Gm. of $(C_{10}H_{15}NO)_2 \cdot H_2SO_4$.

Storage—Preserve Ephedrine Sulfate Tablets in well-closed containers.

Sizes—Ephedrine Sulfate Tablets usually available contain the following amounts of ephedrine sulfate: 15, 25, and 30 mg. ($\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ grain).

AVERAGE DOSE OF EPHEDRINE SULFATE—Metric, 25 mg.—
Apothecaries, $\frac{3}{8}$ grain.

TABELLÆ ERGONOVINÆ MALEATIS

Ergonovine Maleate Tablets

Tab. Ergonov. Mal.

Ergonovine Maleate Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of ergonovine maleate, $C_{12}H_{23}N_3O_2 \cdot C_4H_4O_4$, including all tolerances (see page 2).

Identification—Triturate well a number of Ergonovine Maleate Tablets, equivalent to about 5 mg. of ergonovine maleate, with 15 cc. of warm water, and filter: the filtrate has a blue fluorescence.

Foreign alkaloids and ergotamine—To 5 cc. of the solution prepared in the test for identification, add 1 drop of diluted hydrochloric acid and a few drops of mercuric potassium iodide T.S.: no precipitate or turbidity is produced.

Ergotoxine and Ergotamine—To the remainder of the solution obtained in the test for identification, add 1 cc. of ammonia T.S., and extract with three 10-cc. portions of ether. Evaporate the combined ether extract to dryness, add to the residue 1 cc. of water and a few drops of diluted hydrochloric acid, warm until dissolved, and transfer into a test tube. Add to the solution 2 cc. of sodium hydroxide (1 in 10), and boil gently. The odor of ammonia is not evolved.

Assay—Weigh a counted number of not less than 50 Ergonovine Maleate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to 6.66 mg. of ergonovine maleate, transfer it completely with the aid of 20 cc. of alcohol to a 100-cc. volumetric flask, and macerate for 30 minutes, agitating the mixture frequently. Dilute to the 100-cc. mark with distilled water, mix the suspension thoroughly, let stand for 5 minutes, then filter through a dry filter into a dry flask, rejecting the first 10 cc. of the filtrate. Transfer exactly 1 cc. of the subsequent filtrate to a suitable tube, and add 1 cc. of distilled water, followed by 4 cc. of *p*-dimethylaminobenzaldehyde T.S., mix, and allow to stand in subdued light for 1 hour. Perform parallel control tests with 0.9 cc. and 1.1 cc. of a solution made by dissolving 10.0 mg. of U. S. P. Ergotoxine Ethanesulfonate Reference Standard in 20 cc. of alcohol and sufficient dis-

tilled water to make exactly 100 cc. The color of the solution obtained with the Ergonovine Maleate Tablets, when viewed transversely against a white background, is not lighter than the control made with 0.9 cc., and not darker than the control made with 1.1 cc. of the ergotoxine ethanesulfonate solution. Comparisons must be made in matched tubes. The color comparison is preferably made in suitable colorimeters.

Storage—Preserve Ergonovine Maleate Tablets in well-closed containers.

Sizes—Ergonovine Maleate Tablets usually available contain the following amounts of ergonovine maleate: 0.2 and 0.5 mg. ($\frac{1}{400}$ and $\frac{1}{20}$ grain).

AVERAGE DOSE OF ERGONOVINE MALEATE—Metric, 0.5 mg.—

Apothecaries, $\frac{1}{120}$ grain.

TABELLÆ ERGOTAMINÆ TARTRATIS

Ergotamine Tartrate Tablets

Tab. Ergotam. Tart.

Ergotamine Tartrate Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of ergotamine tartrate, $(C_{33}H_{35}N_5O_5)_2 \cdot H_2C_4H_4O_6$, including all tolerances (see page 2).

Identification—

A: One mg. of the residue obtained in the assay responds to *identification test C* under *Ergotaminæ Tartras*, page 167.

B: Dissolve about 2 mg. of the residue obtained in the assay in 5 cc. of distilled water with the aid of a few drops of diluted hydrochloric acid. Two-cc. portions of the solution yield distinct turbidities with a few drops of trinitrophenol T.S. and with potassium mercuric iodide T.S.

Assay—Weigh a counted number of not less than 20 Ergotamine Tartrate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 30 mg. of ergotamine tartrate, and triturate it in a mortar with 10 cc. of purified benzin. Allow to settle, and decant the purified benzin through a small filter paper, retaining the powder as completely as possible in the mortar. Re-extract the powder in the same manner with another 10 cc. of purified benzin. Discard the purified benzin extracts. Add to the residue 15 cc. of chloroform saturated with ammonia (prepared by shaking chloroform with strong ammonia solution, then drawing off the chloroform layer). Repeat the extraction with ammoniacal chloroform three times, using 15 cc., 10 cc., and 10 cc., respectively, of the ammoniacal chloroform. Transfer the residue to the filter through which the purified benzin was filtered, and wash the triturating vessel and the filter with several small portions of the ammoniacal chloroform. Wash the combined chloroform extracts with 10 cc. of distilled water, then wash the water with 10 cc. of chloroform, adding this chloroform to the main chloroform solution. Evaporate the combined chloroform solutions nearly to dryness at a low temperature, preferably with the aid of a current of air, then add 3 cc. of alcohol, and evaporate to dryness. Re-evaporate with 3 cc. of alcohol, and dry the residue in a vacuum over sulfuric acid for 18 hours, and weigh. The weight of the ergotamine so obtained, multiplied by 1.129, represents the weight of the ergotamine tartrate.

Storage—Preserve Ergotamine Tartrate Tablets in well-closed containers.

Sizes—Ergotamine Tartrate Tablets usually available contain the following amounts of ergotamine tartrate: 0.5 and 1 mg. ($\frac{1}{20}$ and $\frac{1}{60}$ grain).

AVERAGE DOSE OF ERGOTAMINE TARTRATE—Metric, 0.5 mg.—

Apothecaries, $\frac{1}{120}$ grain.

TABELLÆ ERYTHRITYLIS TETRANITRATIS

Erythrityl Tetranitrate Tablets

Tab. Erythrit. Tetranit.—Erythritylis Tetranitras Dilutus U. S. P. XI, Erythrol Tetranitrate Tablets, Tetranitrol Tablets

Erythrityl Tetranitrate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of erythrityl tetranitrate [$C_4H_6(NO_3)_4$], mol. wt. 302.12.

Solubility—Erythrityl Tetranitrate Tablets are partially soluble in alcohol and in ether (*erythrityl tetranitrate*), and are partially soluble in water (*lactose*).

Melting point—The residue obtained in the assay melts between 60° and 61° C.

Caution—The erythrityl tetranitrate used in this test may explode on percussion. The operator must be protected by a glass screen while determining the melting point.

Identification—Dissolve about 10 mg. of the residue obtained in the assay in 1 cc. of distilled water and 2 cc. of sulfuric acid, cool, and overlay with 3 cc. of ferrous sulfate T.S.: a brown color is produced at the zone of contact of the two liquids.

Assay—Weigh accurately a counted number of not less than 20 Erythrityl Tetranitrate Tablets, and carefully reduce them to a powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.25 Gm. of Erythrityl Tetranitrate. Transfer it to a small, lipped, glass mortar, and add enough ether to make the total liquid measure about 20 cc. Cautiously triturate with the ether for 5 minutes, then allow the undissolved portion to subside, and carefully decant the ether through a small filter paper wetted with ether, into a tared beaker. Repeat this extraction with ether several times, each time with about 10 cc. of ether, until 0.5 cc. of the last filtrate, evaporated to dryness at room temperature, leaves no weighable residue. Wash the filter paper and the stem of the funnel with 5 cc. of ether, evaporate the combined ether extracts and washings to dryness at a temperature not exceeding 35° C., dry over sulfuric acid, in a vacuum desiccator for 18 hours, and weigh the erythrityl tetranitrate thus obtained.

Storage—Preserve Erythrityl Tetranitrate Tablets in well-closed containers.

Sizes—Erythrityl Tetranitrate Tablets usually available contain the following amounts of erythrityl tetranitrate: 15 and 30 mg. ($\frac{1}{4}$ and $\frac{1}{2}$ grain).

AVERAGE DOSE OF ERYTHRITYL TETRANITRATE—Metric, 30 mg.—Apothecaries, $\frac{1}{2}$ grain.

TABELLÆ EXTRACTI FELLIS BOVIS

Extract of Ox Bile Tablets

Tab. Ext. Fel. Bov.

Extract of Ox Bile Tablets contain an amount of the Extract corresponding, in their content of ox bile acids, determined as cholic acid, to not less than 40 per cent of the labeled amount of the Extract, including all tolerances (see page 2).

Assay—Weigh a counted number of not less than 20 Extract of Ox Bile Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to 1.00 Gm. of extract of ox bile, and triturate it in a mortar with 20 cc. of 80 per cent alcohol for 15 minutes. Decant the liquid through a filter into a 50-cc. volumetric flask. Triturate the residue with 10 cc. of 80 per cent alcohol for 5 minutes, then transfer the mixture to the filter. Wash

the mortar and the filter with small portions of 80 per cent alcohol until the filtrate measures nearly 50 cc., then add sufficient alcohol to make exactly 50 cc., and mix well. Dilute exactly 5 cc. of the solution with sufficient alcohol to make 100 cc., and mix well. Transfer exactly 1 cc. of the dilution to a test tube of from 15- to 16-mm. diameter and remove the alcohol by evaporation in a vacuum at room temperature.

Dissolve 40.0 mg. of U. S. P. Cholic Acid Reference Standard in 1.2 cc. of tenth-normal sodium hydroxide and sufficient alcohol to make 100 cc., and mix well, then proceed as directed in the *assay* under *Extractum Felle Bovis*, page 177, beginning with the words "transfer exactly 1 cc. of this solution to a test tube."

Storage—Preserve Extract of Ox Bile Tablets in tight containers.

Sizes—Extract of Ox Bile Tablets usually available contain the following amount of extract of ox bile: 0.3 Gm. (5 grains).

AVERAGE DOSE OF EXTRACT OF OX BILE—Metric, 0.3 Gm.—
Apothecaries, 5 grains.

TABELLÆ FERRI SULFATIS

Ferrous Sulfate Tablets

Tab. Ferr. Sulf.

Ferrous Sulfate Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of ferrous sulfate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$), including all tolerances (see page 2).

Identification—Dissolve a quantity of the powdered Tablets, equivalent to about 1 Gm. of ferrous sulfate, in sufficient distilled water acidulated with hydrochloric acid to make 25 cc. of a 1 in 100 solution. The solution responds to the tests for ferrous iron, page 590, and for sulfate, page 592.

Assay—Weigh a counted number of not less than 20 Ferrous Sulfate Tablets, and crush them well without appreciable loss. Weigh accurately a portion of the crushed Tablets, equivalent to about 0.5 Gm. of ferrous sulfate, in a beaker, and dissolve in a mixture of 20 cc. of diluted sulfuric acid and 80 cc. of freshly boiled and cooled distilled water. Filter the solution rapidly as soon as all soluble ingredients in the tablets are dissolved, and wash the beaker and filter with small portions of a mixture of 20 cc. of diluted sulfuric acid and 80 cc. of distilled water. Then titrate immediately the combined filtrate and washings with tenth-normal ceric sulfate, using from 0.1 to 0.2 cc. of orthophenanthroline T.S. as the indicator. Each cc. of tenth-normal ceric sulfate is equivalent to 0.02780 Gm. of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.

Storage—Preserve Ferrous Sulfate Tablets in tight containers.

Sizes—Ferrous Sulfate Tablets usually available contain the following amount of ferrous sulfate: 0.3 Gm. (5 grains).

AVERAGE DOSE OF FERROUS SULFATE—Metric, 0.3 Gm.—
Apothecaries, 5 grains.

TABELLÆ GLYCERYLIS TRINITRATIS

Glyceryl Trinitrate Tablets

Tab. Glyceryl. Trinitrat.—Nitroglycerin Tablets, Trinitrin Tablets

Glyceryl Trinitrate Tablets contain not less than 80 per cent and not more than 112 per cent of the labeled amount of $\text{C}_3\text{H}_5(\text{NO}_3)_3$, including all tolerances (see page 2).

Assay—Weigh a counted number of not less than 20 Glyceryl Trinitrate Tablets, and carefully reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 0.05 Gm. of nitroglycerin, and transfer it to a 400-cc. beaker. Add 50 cc. of ether, stir well during 5 minutes, then allow to settle. Decant the clear ether through a dry filter paper into an 800-cc. Kjeldahl flask. Repeat the extraction three times with 25-cc. portions of ether in the same manner as before. Transfer the undissolved residue to a separator with the aid of about 25 cc. of distilled water, and agitate until no more seems to dissolve. Shake the solution with four 25-cc. portions of ether, filtering the ether through the same filter paper as before into the Kjeldahl flask. Wash the filter and funnel with some additional ether, receiving the washings in the Kjeldahl flask. Evaporate the ether by means of a current of warm air to about 20 cc., add 100 cc. of distilled water, and remove most of the remaining ether with a current of air. Add a mixture of 30 cc. of normal sodium hydroxide, 60 cc. of distilled water, and 10 cc. of a 5 per cent aqueous solution of potassium permanganate, and follow with 100 cc. of distilled water. Mix well, allow to stand for 30 minutes, then heat on a water bath for 30 minutes. Cool well, add 3 Gm. of powdered Devarda's alloy, immediately stopper the flask with a stopper carrying a scrubber, and connected with a vertical condenser by means of a Kjeldahl connecting bulb and with a suitable receiver containing 50 cc. of fiftieth-normal sulfuric acid. Heat the flask with a low flame as long as hydrogen is evolved, then raise the flame and heat until about two-thirds of the contents of the flask has distilled. Titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank determination with the same quantities of the reagents and in the same manner and make any necessary correction. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.001514 Gm. of $C_3H_5(NO_3)_3$.

Storage—Preserve Glyceryl Trinitrate Tablets in well-closed containers.

Sizes—Glyceryl Trinitrate Tablets usually available contain the following amounts of glyceryl trinitrate: 0.3, 0.4, 0.6, and 1.2 mg. ($\frac{1}{200}$, $\frac{1}{140}$, $\frac{1}{100}$, and $\frac{1}{50}$ grain).

AVERAGE DOSE OF GLYCERYL TRINITRATE—Metric, 0.4 mg.—

Apothecaries, $\frac{1}{150}$ grain.

TABELLÆ MAGNESII PHOSPHATIS TRIBASICI

Tribasic Magnesium Phosphate Tablets

Tab. Mag. Phos. Tribas.

Tribasic Magnesium Phosphate Tablets contain not less than 94 per cent and not more than 108 per cent of the labeled amount of tribasic magnesium phosphate [$Mg_3(PO_4)_2 \cdot 5H_2O$], including all tolerances (see page 2).

Identification—Finely powder a number of Tribasic Magnesium Phosphate Tablets, equivalent to about 2 Gm. of tribasic magnesium phosphate, and ignite to destroy any carbonaceous matter. Dissolve about 0.1 Gm. of the ignited powder in diluted nitric acid, filter if necessary, warm the solution to about 60° C., and add ammonium molybdate T.S.: a yellow precipitate is produced.

Calcium—Mix 0.5 Gm. of the ignited powder obtained in the test for *identification* with 15 cc. of distilled water, heat, and add hydrochloric acid in small portions until no more dissolves. Add ammonia T.S. in small portions until a permanent slight precipitate is produced, then 2 cc. of acetic acid, dilute with distilled water to 25 cc., and filter if necessary. To 10 cc. of the filtrate add 2 cc. of ammonium oxalate T.S.: not more than a slight turbidity is produced within 5 minutes.

Soluble salts—Digest 1 Gm. of the ignited powder with 50 cc. of distilled water on a

steam bath for 30 minutes. Cool, add sufficient distilled water to restore the original volume, mix well, filter, and wash with 10 cc. of distilled water. Evaporate the filtrate and washings to dryness, and ignite gently to constant weight: the weight of the residue does not exceed 15 mg.

Assay—Weigh a counted number of not less than 20 Tribasic Magnesium Phosphate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.25 Gm. of tribasic magnesium phosphate, and carefully ignite it in a crucible at a low temperature, taking care to avoid any loss. Dissolve the residue by warming with 5 cc. of nitric acid and 10 cc. of distilled water, filter into a beaker, and thoroughly wash the crucible and filter with hot distilled water. To the combined filtrate and washings add ammonia T.S. until a slight precipitate is formed, then dissolve the precipitate by the addition of 1 cc. of nitric acid. Warm the solution to about 50° C., add 80 cc. of ammonium molybdate T.S., and maintain the temperature of the mixture at about 50° C. for 30 minutes, stirring occasionally. Wash the precipitate once or twice by decantation with distilled water, using 30 cc. to 40 cc. each time. Transfer the precipitate to a filter, and wash with cold distilled water until the washings cease to give an acid reaction to litmus paper. Transfer the precipitate and filter to the precipitating vessel, add 30 cc. of normal sodium hydroxide, agitate until the precipitate is dissolved, then titrate the excess of alkali with half-normal sulfuric acid, using 3 drops of phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.007676 Gm. of $[Mg_3(PO_4)_2 \cdot 5H_2O]$.

Storage—Preserve Tribasic Magnesium Phosphate Tablets in well-closed containers.

Sizes—Tribasic Magnesium Phosphate Tablets usually available contain the following amounts of the phosphate: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF TRIBASIC MAGNESIUM PHOSPHATE—Metric,
1 Gm.—Apothecaries, 15 grains.

TABELLÆ MAGNESII TRISILICATIS

Magnesium Trisilicate Tablets

Tab. Mag. Trisil.

Magnesium Trisilicate Tablets conform to the tests given below.

Weigh a counted number of not less than 20 Magnesium Trisilicate Tablets, and reduce them without appreciable loss to a powder, all of which passes through a 200 mesh sieve. Use this powder for the following tests:

Identification—

- A: Mix a quantity of the powder, equivalent to about 0.5 Gm. of magnesium trisilicate, with 10 cc. of diluted hydrochloric acid, allow to stand for 20 minutes, and filter. The filtrate responds to the tests for magnesium, page 590.
- B: Ignite a portion of the powder until any organic matter present is consumed. Prepare a bead by fusing a few crystals of sodium ammonium phosphate on the loop of a platinum wire. Place the hot, transparent bead in contact with the ignited magnesium trisilicate, and fuse again: silica floats about in the bead with a web-like structure.

Free alkali—Boil a quantity of the powder, equivalent to 1.0 Gm. of magnesium trisilicate, with 40 cc. of distilled water for 2 minutes. Cool, add sufficient distilled water to restore the original volume, filter, and add 2 drops phenolphthalein T.S. to the filtrate. If a pink color is produced, it is discharged by the addition of not more than 0.5 cc. of tenth-normal hydrochloric acid.

Acid-consuming capacity—Weigh accurately a quantity of the powder corresponding to 0.2 Gm. of magnesium trisilicate, and transfer it to a 125-cc. glass-stoppered Erlenmeyer flask. Add exactly 30 cc. of tenth-normal hydrochloric acid and exactly 20 cc. of distilled water. Place the flask in a water bath maintained at

37° C., and shake the flask occasionally during 4 hours, but leaving the mixture undisturbed during the last 15 minutes. Remove the flask from the bath, withdraw by means of a pipette 25 cc. of the supernatant liquid, and titrate the excess acid with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. The volume of tenth-normal acid consumed corresponds to not less than 85 cc. and not more than 110 cc. per Gm. of the magnesium trisilicate taken.

Adsorption of methylene blue—Place a quantity of the powder, equivalent to 1 Gm. of magnesium trisilicate, in a glass-stoppered cylinder, and add 70 cc. of an aqueous solution of methylene blue containing 1 Gm. of methylene blue in 1000 cc. Shake the mixture continuously for 5 minutes, then intermittently during the remainder of 1 hour. Allow to settle, and filter through a sintered glass filtering crucible collecting about 20 cc.: the filtrate has no more color than a dilution of 0.2 cc. of the methylene blue solution with sufficient distilled water to make 100 cc.

Storage—Preserve Magnesium Trisilicate Tablets in well-closed containers.

Sizes—Magnesium Trisilicate Tablets usually available contain the following amounts of magnesium trisilicate: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF MAGNESIUM TRISILICATE—Metric, 1 Gm.—
Apothecaries, 15 grains.

TABELLE MENADIONI

Menadione Tablets

Tab. Menadion.

Menadione Tablets contain not less than 95 per cent and not more than 115 per cent of the labeled amount of menadione, $C_{11}H_8O_3$, including all tolerances (see page 2).

Identification—Powder a sufficient number of Menadione Tablets to yield about 10 mg. of Menadione. Macerate the powder with two successive portions of 10 cc. each of chloroform, and decant the chloroform solution through a filter. Evaporate the chloroform extract to dryness with the aid of a current of air while protected from light. To 5 mg. of the residue add 1 cc. of distilled water and 7.5 mg. of sodium bisulfite, and heat on the steam bath, shaking vigorously, until the Menadione is dissolved and the solution is nearly colorless. Dilute to 5 cc. with distilled water, and mix well. To 2 cc. of the solution add 2 cc. of alcoholic ammonia (prepared by mixing equal volumes of alcohol and of stronger ammonia T.S.), shake, and add 3 drops of ethyl cyanoacetate: a deep purplish blue color is produced which, on the addition of 1 cc. of an aqueous solution of sodium hydroxide (1 in 3), changes to green and then to yellow.

Assay—Weigh a counted number of not less than 20 Menadione Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 20 mg. of menadione, and triturate it well with 10 cc. of chloroform. Allow the powder to subside, then decant the liquid through a sintered glass filter into a flask. Repeat the trituration twice in a similar manner with 10-cc. portions of chloroform. Finally transfer the residue to the filter with the aid of chloroform, and wash the triturating vessel and filter with 5-cc. portions of chloroform until the washings are colorless. Evaporate the combined chloroform extracts and washings to dryness with the aid of a current of air while protected from light. Add to the residue 7 cc. of glacial acetic acid, agitate until dissolved, then add 10 cc. of diluted hydrochloric acid and about 0.5 Gm. of zinc powder (zinc dust). Stopper the flask with a Bunsen valve, and allow to stand in the

dark for 20 minutes, or until the solution is colorless. Rapidly decant the liquid through a pledget of cotton into another flask, wash the flask in which the reduction was made and the filter with three 5-cc. portions of freshly boiled and cooled distilled water, then titrate at once the combined filtrate and washings with fiftieth-normal ceric sulfate, using 0.1 cc. of ortho-phenanthroline T.S. as the indicator. Perform a blank test with the same reagents and in the same manner, and make any necessary correction. Each cc. of fiftieth-normal ceric sulfate is equivalent to 0.001722 Gm. of $C_{11}H_8O_2$.

Storage—Preserve Menadione Tablets in well-closed containers.

Sizes—Menadione Tablets usually available contain the following amount of menadione: 1 mg. ($\frac{1}{60}$ grain).

AVERAGE DOSE OF MENADIONE—Metric, 1 mg.—Apothecaries, $\frac{1}{60}$ grain.

TABELLÆ METHENAMINÆ

Methenamine Tablets

Tab. Methenam.

Methenamine Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of methenamine $[(CH_2)_6N_4]$, including all tolerances (see page 2).

Identification—Dissolve about 0.5 Gm. of powdered Methenamine Tablets in 10 cc. of water, add 10 cc. of diluted sulfuric acid, and heat: formaldehyde is liberated, recognizable by its odor and by its darkening paper moistened with silver ammonium nitrate T.S. On the subsequent addition of an excess of sodium hydroxide T.S., ammonia is liberated.

Assay—Weigh a counted number of not less than 20 Methenamine Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 1 Gm. of methenamine, and transfer it completely to a beaker. Add 40 cc. of normal sulfuric acid, and boil gently, adding a little distilled water from time to time, if necessary, until the odor of formaldehyde is no longer perceptible. Cool, add 20 cc. of distilled water, and titrate the excess of acid with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 0.03505 Gm. of $(CH_2)_6N_4$.

Storage—Preserve Methenamine Tablets in well-closed containers.

Sizes—Methenamine Tablets usually available contain the following amounts of methenamine: 0.3 and 0.5 Gm. (5 and $7\frac{1}{2}$ grains).

AVERAGE DOSE OF METHENAMINE—Metric, 0.5 Gm.—Apothecaries, $7\frac{1}{2}$ grains.

TABELLÆ MORPHINÆ SULFATIS

Morphine Sulfate Tablets

Tab. Morph. Sulf.

Morphine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of morphine sulfate $[(C_{17}H_{19}O_3N)_2 \cdot H_2SO_4 \cdot 5H_2O]$, including all tolerances (see page 2).

Identification—Powdered Morphine Sulfate Tablets respond to *identification tests B, C, D, E, and F*, under *Morphinæ Sulfas*, page 297.

Assay—Weigh a counted number of not less than 20 Morphine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered Tablets, equivalent to about 0.12 Gm. of morphine sulfate, and transfer it completely to a separator with the aid of 10 cc. of distilled water. Add 2 drops of hydrochloric acid, then make the solution distinctly alkaline with ammonia T.S., and extract the alkaloid completely by shaking the mixture first with 30 cc., then with successive 15-cc. portions of a mixture of 4 volumes of chloroform and 1 volume of alcohol. Wash the combined extracts with 5 cc. of distilled water, and extract the water twice with 3-cc. portions of the chloroform-alcohol solvent. Filter the combined chloroform-alcohol extracts, and wash the separator and filter with two 5-cc. portions of the solvent. Evaporate the solution nearly to dryness on a steam bath with the aid of a current of air, add to the residue exactly 25 cc. of fiftieth-normal sulfuric acid, and heat gently to dissolve the morphine and expel the remaining chloroform. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.007588 Gm. of $(C_{17}H_{19}O_3N)_2 \cdot H_2SO_4 \cdot 5H_2O$.

NOTE—These identification tests and the assay are applicable to Morphine Sulfate Tablets for hypodermic use. If the tablets contain substances which may interfere with *identification tests B, C, D, and E*, proceed as follows:

Digest a quantity of powdered Morphine Sulfate Tablets with 10 cc. of distilled water acidified with 2 drops of hydrochloric acid, and filter. Render the filtrate alkaline with ammonia T.S., and extract with 25 cc. of the chloroform-alcohol solvent described in the assay. Evaporate the chloroform-alcohol solution to dryness on a steam bath, and use the residue for *identification tests B, C, D, and E*.

For other than hypodermic tablets, a suitable modification of the assay given above may be necessary.

Storage—Preserve Morphine Sulfate Tablets in tight containers.

Sizes—Morphine Sulfate Tablets usually available contain the following amounts of morphine sulfate: 5, 8, 10, 15, and 30 mg. ($\frac{1}{12}$, $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$, and $\frac{1}{2}$ grain).

AVERAGE DOSE OF MORPHINE SULFATE—Metric, 10 mg.—
Apothecaries, $\frac{1}{6}$ grain.

TABELLÆ NEOCINCHOPHENI

Neocinchophen Tablets

Tab. Neocinchophen.

Neocinchophen Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of neocinchophen ($C_{19}H_{17}O_2N$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Neocinchophen Tablets, equivalent to about 1 Gm. of neocinchophen, with two 10-cc. portions of purified benzin, and discard the latter. Macerate the residue with 50 cc. of ether for 10 minutes, filter, evaporate the filtrate at a temperature not above 40° C., and dry at about 60° C. The residue of neocinchophen so obtained does not melt below 74° C., and responds to *identification tests A and B* under *Neocinchophenum*, page 303.

Cinchophen—Warm about 0.25 Gm. of the residue of neocinchophen obtained in the preceding test with 5 cc. of ammonia T.S., filter, and neutralize the filtrate with diluted hydrochloric acid: no precipitate is formed.

Assay—Weigh a counted number of not less than 20 Neocinchophen Tablets, and reduce them to a fine powder without appreciable loss. Heat an accurately weighed portion of the powder, equivalent to about 2 Gm. of neocinchophen, under a reflux condenser for 15 minutes with 50 cc. of alcohol, then decant while hot through a filter into a 200-cc. volumetric flask. Heat the undissolved residue again

with 50 cc. of alcohol for 15 minutes, and filter while hot. Transfer the residue to the filter with the aid of hot alcohol, and wash it with small portions of alcohol until the total volume is about 180 cc. Cool quickly, add alcohol to the 200-cc. mark, and mix. Transfer exactly 50 cc. of the solution to an Erlenmeyer flask, add exactly 40 cc. of tenth-normal alcoholic potassium hydroxide, and boil under a reflux condenser for 1 hour. Cool, and titrate the excess of potassium hydroxide with tenth-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Standardize the tenth-normal potassium hydroxide by mixing 40 cc. of it with 50 cc. of the same alcohol, heat the solution in the same manner as the sample, and titrate with tenth-normal hydrochloric acid, using phenolphthalein T.S. as indicator.

Titrate another 50-cc. portion of the alcoholic extract of the Tablets with tenth-normal alcoholic potassium hydroxide, using phenolphthalein T.S. as the indicator. The difference between the volume of tenth-normal alcoholic potassium hydroxide consumed in the saponification and in this titration, multiplied by 0.02913, represents the weight of neocinchophen in one-fourth of the weight of the Tablets taken for the assay.

Storage—Preserve Neocinchophen Tablets in well-closed containers.

Sizes—Neocinchophen Tablets usually available contain the following amounts of neocinchophen: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF NEOCINCOPHEN—Metric, 0.3 Gm.—
Apothecaries, 5 grains.

TABELLÆ NEOSTIGMINÆ BROMIDI

Neostigmine Bromide Tablets

Tab. Neostig. Bromid.

Neostigmine Bromide Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of neostigmine bromide ($C_{12}H_{19}N_2O_2Br$), including all tolerances (see page 2).

Identification—Triturate a quantity of powdered Neostigmine Bromide Tablets, equivalent to about 0.3 Gm. of neostigmine bromide, with three 5-cc. portions of ether, and discard the ether. Macerate the residue with several 10-cc. portions of alcohol, filtering after each maceration. Evaporate the combined alcohol filtrates on a steam bath, and dry the residue to about 80° C. The residue of neostigmine bromide so obtained melts at about 167° C., with decomposition, and responds to *identification tests A and B under Neostigminæ Bromidum*, page 304.

Assay—Weigh a counted number of not less than 20 Neostigmine Bromide Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.3 Gm. of neostigmine bromide, and macerate it for 15 minutes with 20 cc. of 70 per cent alcohol containing 1 cc. of diluted hydrochloric acid in each 100 cc. Decant the alcohol through a small filter, and extract the residue by maceration with three successive portions of 15 cc. each of 70 per cent alcohol. Finally transfer the residue completely to the filter, and wash it with a few 5-cc. portions of alcohol. Evaporate the combined alcohol filtrates to about 10 cc., and completely transfer the residual solution by means of small portions of alcohol to a Kjeldahl flask. Add 200 cc. of distilled water and 20 cc. of sodium hydroxide solution (1 in 10) and connect the flask by means of a distillation trap to a well-cooled condenser which dips into a vessel containing exactly 25 cc. of tenth-normal sulfuric acid. Distil about 200 cc. of the contents of the flask, then add about 5 drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-normal sodium hydroxide. Perform a blank test with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal acid is equivalent to 0.03032 Gm. of $C_{12}H_{19}N_2O_2Br$.

Storage—Preserve Neostigmine Bromide Tablets in tight containers.

Sizes—Neostigmine Bromide Tablets usually available contain the following amount of neostigmine bromide: 15 mg. ($\frac{1}{4}$ grain).

AVERAGE DOSE OF NEOSTIGMINE BROMIDE—Metric, 15 mg.—
Apothecaries, $\frac{1}{4}$ grain.

TABELLÆ NICOTINAMIDI

Nicotinamide Tablets

Tab. Nicotinamid.—Niacinamide Tablets

Nicotinamide Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of nicotinamide ($C_6H_6N_2O$), including all tolerances (see page 2).

Identification—

- A: Extract a quantity of powdered Nicotinamide Tablets, equivalent to about 0.5 Gm. of nicotinamide, with two 10-cc. portions of alcohol, evaporate the filtered alcohol extracts on a steam bath, and dry at about 80° C. The residue of nicotinamide so obtained melts between 128° and 131° C. and responds to *identification test A* under *Acidum Nicotinicum*, page 25.
- B: Dissolve 0.1 Gm. of the residue obtained in the preceding test in 5 cc. of distilled water, add 5 cc. of sodium hydroxide T.S., and boil gently until the odor of ammonia is no longer perceptible. Cool, neutralize with normal sulfuric acid, using phenolphthalein T.S. as the indicator, and add a few cc. of cupric sulfate T.S.: a blue precipitate gradually forms. Filter the precipitate, and ignite a portion of it on platinum: the odor of pyridine is evolved.

Assay—Weigh a counted number of not less than 20 Nicotinamide Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a quantity of the powder, equivalent to about 0.3 Gm. of nicotinamide, and gently reflux it with 20 cc. of alcohol for 10 minutes. Filter, and re-extract the residue three times with 15-cc. portions of hot alcohol, filtering the alcohol after each extraction. Finally collect the insoluble residue on a filter, and wash the flask and the filter with several 5-cc. portions of hot alcohol. Evaporate the combined alcohol extract on a steam bath to about 10 cc., and completely transfer the residual solution with the aid of some distilled water to a Kjeldahl flask connected by means of a trap with a well-cooled condenser, the end of which dips in a receiver containing 40 cc. of tenth-normal sulfuric acid. Add to the distillation flask about 200 cc. of distilled water and 50 cc. of 30 per cent sodium hydroxide solution, boil gently for 15 minutes, distil until about 200 cc. of distillate has been collected, and titrate the excess acid with tenth-normal sodium hydroxide, using methyl red T.S. as indicator. Each cc. of tenth-normal acid is equivalent to 0.01221 Gm. of $C_6H_6N_2O$.

Storage—Preserve Nicotinamide Tablets in tight containers.

Sizes—Nicotinamide Tablets usually available contain the following amounts of nicotinamide: 25 and 50 mg. ($\frac{3}{8}$ and $\frac{3}{4}$ grain).

AVERAGE DOSE OF NICOTINAMIDE—Metric, 25 mg.—Apothecaries, $\frac{3}{8}$ grain.

TABELLÆ PENTOBARBITALI SODICI

Pentobarbital Sodium Tablets

Tab. Pentobarb. Sod.—Soluble Pentobarbital Tablets

Pentobarbital Sodium Tablets contain not less than 90 per cent and not more than 105 per cent of the labeled amount of pentobarbital sodium ($C_{11}H_{17}N_2O_3Na$), including all tolerances (see page 2).

Identification—

- A: Digest a quantity of finely powdered Pentobarbital Sodium Tablets, equivalent to about 1 Gm. of pentobarbital sodium, with 20 cc. of distilled water, and filter if necessary. A 10-cc. portion of the filtrate responds to *identification test C* under *Pentobarbitalum Sodicum*, page 349.
- B: To the remaining portion of the filtrate from *test A* add a slight excess of diluted hydrochloric acid: a white precipitate of pentobarbital is formed. Collect the precipitate on a filter, wash it with cold distilled water until the washings are free from chloride, and dry at about 80° C.: the melting point of the pentobarbital so obtained is between 127° and 130° C., page 595.
- C: The aqueous solution of Pentobarbital Sodium Tablets responds to the flame test for sodium, page 592.

Assay—Weigh a counted number of not less than 20 Pentobarbital Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.3 Gm. of pentobarbital sodium, transfer it completely to a separator, and dissolve it as far as possible in 10 cc. of an alkaline sodium chloride solution, made by saturating an aqueous (1 in 50) solution of sodium hydroxide with sodium chloride. Extract the solution with two 10-cc. portions of ether, and discard the ether. Add 2 cc. of hydrochloric acid and 5 cc. of distilled water, and completely extract the pentobarbital with a solvent composed of 2 volumes of alcohol, 1 volume of ether, and 7 volumes of chloroform. Wash the combined extracts with 5 cc. of distilled water acidified with a drop of hydrochloric acid, then filter through a pledget of cotton or other suitable filter into a tared beaker, and wash the separator and the filter with several small portions of the solvent. Evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, and dry the residue of pentobarbital at 100° C. for 2 hours, cool and weigh. The weight of the pentobarbital so obtained, multiplied by 1.097, represents the weight of pentobarbital sodium in the portion of the Tablets taken for the assay.

Storage—Preserve Pentobarbital Sodium Tablets in tight containers.

Sizes—Pentobarbital Sodium Tablets usually available contain the following amounts of pentobarbital sodium: 30, 50, and 100 mg. ($\frac{1}{2}$, $\frac{3}{4}$, and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF PENTOBARBITAL SODIUM—Metric, 0.1 Gm.

—Apothecaries, $1\frac{1}{2}$ grains.

TABELLÆ PHENOBARBITALI

Phenobarbital Tablets

Tab. Phenobarb.

Phenobarbital Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of phenobarbital ($C_{12}H_{12}N_2O_3$), including all tolerances (see page 2).

Identification—Triturate a quantity of the finely powdered Phenobarbital Tablets, equivalent to about 0.5 Gm. of phenobarbital, with 10 cc. of purified benzin, then decant the liquid as completely as possible. Again treat the residue in the same manner with 5 cc. of purified benzin, and evaporate any benzin remaining in the residue on a steam bath. Dissolve the residue by warming with 10 cc. of sodium carbonate T.S., and filter. Add hydrochloric acid dropwise to the filtrate until no more precipitate is produced. Collect the precipitate on a filter, wash it well with small portions of cold distilled water until the washings are free from chloride, and dry at about 80° C. The resulting phenobarbital melts between 173° and 177° C., page 595, and responds to the *identification tests* under *Phenobarbitalum*.

Assay—Weigh a counted number of not less than 20 Phenobarbital Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.3 Gm. of phenobarbital, transfer it to a glass-stoppered Erlenmeyer flask, and add 100 cc. of a solution prepared by saturating a saturated aqueous solution of sodium chloride with reagent barium hydroxide and then filtering it. Shake the mixture in the stoppered flask for 10 minutes, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer 50 cc. of the subsequent filtrate to a separator, and render it acid to litmus with hydrochloric acid. Add 5 cc. of distilled water, and extract the precipitated phenobarbital completely with a solvent consisting of 80 volumes of chloroform and 20 volumes of ether. Wash the combined extracts with 10 cc. of distilled water acidified with a few drops of hydrochloric acid, then extract the aqueous wash liquid with two 10-cc. portions of the solvent, and add them to the main extract. Filter the extract through a filter paper, previously wetted with the solvent, into a tared beaker, and wash the separator and the filter with two 10-cc. portions of the solvent. Evaporate the extracts to dryness on a steam bath with the aid of a current of air, then dry at 100° C. for 2 hours, cool, and weigh. The weight of the residue represents the amount of phenobarbital in the portion of the Tablets taken for the assay.

Storage—Preserve Phenobarbital Tablets in well-closed containers.

Sizes—Phenobarbital Tablets usually available contain the following amounts of phenobarbital: 15, 30, and 100 mg. ($\frac{1}{4}$, $\frac{1}{2}$, and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF PHENOBARBITAL—Metric, 30 mg.—Apothecaries, $\frac{1}{2}$ grain.

TABELLÆ PHENOBARBITALI SODICI

Phenobarbital Sodium Tablets

Tab. Phenobarb. Sod.—Soluble Phenobarbital Tablets

Phenobarbital Sodium Tablets contain not less than 90 per cent and not more than 105 per cent of the labeled amount of phenobarbital sodium ($C_{12}H_{11}N_2O_3Na$), including all tolerances (see page 2).

Identification—

A: Digest a quantity of finely powdered Phenobarbital Sodium Tablets, equivalent to about 1 Gm. of phenobarbital sodium, with 10 cc. of distilled water, and filter if necessary. Add to the filtrate 2 cc. of diluted hydrochloric acid: a white precipitate of phenobarbital is produced. Collect the precipitate on a filter, wash it with cold distilled water until the washings are free from chloride, then dry at 80° C. The phenobarbital so obtained melts

between 174° and 178° C., page 595, and responds to *identification tests A and B* under *Phenobarbitalum*, page 355.

B: An aqueous solution of Phenobarbital Sodium Tablets responds to the flame test for sodium, page 592.

Assay—Weigh a counted number of not less than 20 Phenobarbital Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.35 Gm. of phenobarbital sodium, transfer it to a glass-stoppered Erlenmeyer flask, and proceed as directed in the Assay of *Tabellæ Phenobarbitali* beginning with, “and add 100 cc. of a solution prepared by.” The weight of phenobarbital so obtained, multiplied by 1.095, represents the weight of phenobarbital sodium in the portion of the Tablets taken.

Storage—Preserve Phenobarbital Sodium Tablets in tight containers.

Sizes—Phenobarbital Sodium Tablets usually available contain the following amounts of phenobarbital sodium: 30 and 100 mg. ($\frac{1}{2}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF PHENOBARBITAL SODIUM—Metric, 30 mg.—
Apothecaries, $\frac{1}{2}$ grain.

TABELLÆ POTASSII CHLORIDI

Potassium Chloride Tablets

Tab. Pot. Chlorid.

Potassium Chloride Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of potassium chloride (KCl), including all tolerances (see page 2).

Identification—An aqueous solution of Potassium Chloride Tablets responds to the tests for potassium, page 592, and for chloride, page 589.

Calcium and magnesium—To 20 cc. of an aqueous solution of the Tablets (1 in 100) filtered if necessary, add 1 cc. of ammonia T.S. and 1 cc. each of ammonium oxalate T.S. and sodium phosphate T.S.: no turbidity is produced in 5 minutes.

Sodium—An aqueous solution of the Tablets (1 in 20), tested on a platinum wire, does not impart a pronounced yellow color to a non-luminous flame.

Assay—Dissolve a counted number of not less than 20 Potassium Chloride Tablets in sufficient distilled water to make 500 cc., and mix well. Transfer an accurately measured aliquot of the solution, equivalent to about 0.25 Gm. of potassium chloride, to a 200-cc. volumetric flask, and add sufficient distilled water to make about 100 cc. Add to the solution, while agitating, exactly 50 cc. of tenth-normal silver nitrate, and follow with 5 cc. of nitric acid, then add distilled water to make 200 cc., and mix well. Filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. To exactly 100 cc. of the subsequent clear filtrate, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.007455 Gm. of KCl.

Storage—Preserve Potassium Chloride Tablets in well-closed containers.

Sizes—Potassium Chloride Tablets usually available contain the following amounts of potassium chloride: 0.3 and 0.5 Gm. (5 and $7\frac{1}{2}$ grains).

AVERAGE DOSE OF POTASSIUM CHLORIDE—Metric, 1 Gm.—
Apothecaries, 15 grains.

TABELLÆ QUINACRINÆ HYDROCHLORIDI

Quinacrine Hydrochloride Tablets

Tab. Quinacrin. Hydrochlor.

Quinacrine Hydrochloride Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of quinacrine hydrochloride, $C_{23}H_{30}ClN_3O \cdot 2HCl \cdot 2H_2O$, including all tolerances (see page 2).

Identification—

- A: Powder a sufficient number of the tablets to yield about 0.25 Gm. of quinacrine hydrochloride, and extract with two 15-cc. portions of hot distilled water, filtering after each extraction. To 5 cc. of the aqueous extract add ammonia T.S., and remove the oily precipitate by extraction with two 10-cc. portions of ether. The aqueous layer, acidulated with nitric acid, responds to the tests for chloride, page 589.
- B: Add to the remaining portion of the aqueous extract 2 cc. of ammonia T.S.: a yellow, oily precipitate forms. Shake the mixture with several 10-cc. portions of chloroform until the aqueous layer is practically colorless. Evaporate the chloroform solution on a steam bath in a small beaker, add to the residue 3 cc. of hot distilled water and 2 cc. of diluted hydrochloric acid, moistening the sides of the beaker with the liquid and stirring with a glass rod. Allow to stand for $\frac{1}{2}$ hour, then filter, and wash with ice-cold distilled water until the washings are practically neutral to litmus, and dry at about $100^\circ C$.: the crystals respond to *identification tests A, B, C*, under *Quinacrinæ Hydrochloridum*, page 383.

Assay—Weigh a counted number of not less than 20 of the Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.25 Gm. of quinacrine hydrochloride, place it in a mortar, and triturate with 10 cc. of ether. Allow to settle, and decant the ether through a small filter, retaining the powder as completely as possible in the mortar. Re-extract the powder in the same manner with another 10 cc. of ether. Discard the ether extracts. Add to the residue 2 cc. of ammonia T.S. and 30 cc. of ether, and triturate well. Allow to settle, and carefully decant the ether solution into a beaker through the same filter as before. Repeat the extraction with 25-cc. portions of ether until the ether extract is no longer colored yellow. Transfer the residue to the filter, and wash the mortar and the filter with several portions of ether until the filtrate is colorless. Add to the combined ether extracts 2 cc. of glacial acetic acid, mix well, and evaporate until the odor of ether is no longer perceptible. Transfer the residue completely with the aid of 75 cc. of warm distilled water to a 200-cc. volumetric flask, cool, and add 10 cc. of a solution, prepared by dissolving 25 Gm. of reagent sodium acetate and 10 cc. of glacial acetic acid in sufficient distilled water to make 100 cc. Then add 50 cc. of tenth-normal potassium dichromate, fill with distilled water to the 200 cc. mark, and mix well. Filter through a dry filter into a dry flask, rejecting the first 15 cc. of the filtrate. Measure 100 cc. of the subsequent filtrate into a glass-stoppered flask, add 15 cc. of hydrochloric acid and 20 cc. of potassium iodide T.S., stopper the flask, and allow to stand in the dark for 5 minutes. Dilute with 75 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. as the indicator when the end-point is neared. Perform a blank with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal potassium dichromate is equivalent to 0.008482 Gm. of $C_{23}H_{30}ClN_3O \cdot 2HCl \cdot 2H_2O$.

Storage—Preserve Quinacrine Hydrochloride Tablets in tight containers.

Sizes—Quinacrine Hydrochloride Tablets usually available contain the following amounts of quinacrine hydrochloride: 50 and 100 mg. ($\frac{3}{4}$ and $1\frac{1}{2}$ grains).

AVERAGE DOSE OF QUINACRINE HYDROCHLORIDE—Metric, 0.1 Gm.—Apothecaries, $1\frac{1}{2}$ grains.

TABELLÆ QUINIDINÆ SULFATIS

Quinidine Sulfate Tablets

Tab. Quinidin. Sulf.

Quinidine Sulfate Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of quinidine sulfate [$(C_{20}H_{24}N_2O_2)_2 \cdot H_2SO_4 \cdot 2H_2O$], including all tolerances (see page 2).

Identification—

- A: Dissolve the residue from the assay by warming with 1 cc. of diluted sulfuric acid and 5 cc. of distilled water, and dilute with distilled water to make 10 cc. The resulting solution has a vivid blue fluorescence and is dextro-rotatory.
- B: One cc. of the solution obtained in test A, when diluted with 5 cc. of distilled water, responds to *identification test C* under *Quinidinæ Sulfas*, page 384.
- C: A filtered aqueous solution of Quinidine Sulfate Tablets responds to the tests for sulfate, page 592.

Assay—Weigh a counted number of not less than 20 Quinidine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 0.4 Gm. of quinidine sulfate, and transfer it completely to a 100-cc. volumetric flask. Add 50 cc. of distilled water and 5 cc. of diluted sulfuric acid, agitate well, and allow the mixture to stand over night. Add sufficient distilled water to make the mixture measure 100 cc., mix well, and filter through an asbestos pad in a Gooch crucible or through a sintered glass crucible. Transfer 50 cc. of the clear filtrate to a separator, render it distinctly alkaline with ammonia T.S., and extract the alkaloid with successive portions of chloroform, using 25 cc., 10 cc., 10 cc., and 10 cc., or more if necessary until the alkaloid is completely extracted. Wash the combined chloroform extract with 5 cc. of distilled water, then filter the chloroform solution through a filter paper moistened with chloroform, and wash the separator and the filter with several 5-cc. portions of chloroform. Evaporate the combined chloroform extracts in a tared vessel on a steam bath, with the aid of a current of air, to about 2 cc., then add 10 cc. of alcohol, evaporate to dryness, and dry at 100° C. to constant weight. The weight of the quinidine so obtained, multiplied by 1.207, represents the equivalent of $(C_{20}H_{24}N_2O_2)_2 \cdot H_2SO_4 \cdot 2H_2O$.

Storage—Preserve Quinidine Sulfate Tablets in well-closed containers.

Sizes—Quinidine Sulfate Tablets usually available contain the following amounts of quinidine sulfate: 0.1, 0.2, and 0.3 Gm. ($1\frac{1}{2}$, 3 and 5 grains).

AVERAGE DOSE OF QUINIDINE SULFATE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

TABELLÆ QUININÆ SULFATIS

Quinine Sulfate Tablets

Tab. Quin. Sulf.

Quinine Sulfate Tablets contain not less than 94 per cent and

not more than 106 per cent of the labeled amount of quinine sulfate $[(C_{20}H_{24}N_2O_2)_2 \cdot H_2SO_4 \cdot 2H_2O]$, including all tolerances (see page 2).

Identification—

A: Dissolve the residue obtained in the assay by warming with 1 cc. of diluted sulfuric acid and 5 cc. of distilled water, and dilute with distilled water to make a volume of 10 cc.: the resulting solution exhibits a vivid blue fluorescence and is levorotatory. One cc. of the solution diluted with 5 cc. of distilled water responds to *identification test B* under *Quininæ Sulfas*, page 390.

B: A filtered aqueous solution of Quinine Sulfate Tablets made with the aid of a few drops of hydrochloric acid responds to the tests for sulfate, page 592.

Assay—Weigh a counted number of not less than 20 Quinine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 0.4 Gm. of quinine sulfate, and transfer it completely to a 100-cc. volumetric flask. Add 50 cc. of distilled water and 5 cc. of diluted sulfuric acid, agitate well, and allow to stand over night. Add distilled water to make the mixture measure 100 cc., mix well, and filter through an asbestos pad in a Gooch crucible or through a sintered glass crucible. Transfer 50 cc. of the clear solution to a separator, render it distinctly alkaline with ammonia T.S., and extract the alkaloid with successive portions of chloroform, using 25 cc., 10 cc., 10 cc., and 10 cc., or more if necessary, until the alkaloid is completely extracted. Wash the combined chloroform extract with 5 cc. of distilled water, then filter the extract through a filter moistened with chloroform, and wash the separator and the filter with several 5-cc. portions of chloroform. Evaporate the combined chloroform extract in a tared vessel on a steam bath with the aid of a current of air to about 2 cc., then add 10 cc. of alcohol, evaporate to dryness, and dry at 100° C. to constant weight. The weight of the quinine so obtained, multiplied by 1.207, represents the equivalent of $(C_{20}H_{24}N_2O_2)_2 \cdot H_2SO_4 \cdot 2H_2O$.

Storage—Preserve Quinine Sulfate Tablets in well-closed containers.

Sizes—Quinine Sulfate Tablets usually available contain the following amounts of quinine sulfate: 0.12, 0.2, and 0.3 Gm. (2, 3, and 5 grains).

AVERAGE DOSE OF QUININE SULFATE—Metric, 0.6 Gm.—

Apothecaries, 10 grains.

TABELLÆ RIBOFLAVINI

Riboflavin Tablets

Tab. Riboflav.

Riboflavin Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of riboflavin $(C_{17}H_{20}N_4O_6)$, including all tolerances (see page 2).

Assay—Weigh a counted number of not less than 20 Riboflavin Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to 10.0 mg. of riboflavin, and dissolve it in sufficient distilled water to make exactly 1000 cc. Allow to stand in the dark until any insoluble matter, if present, has subsided, and the supernatant liquid is clear. If the insoluble matter does not subside, filter the solution in diffused light through a sintered glass filter. Prepare concurrently control solutions in distilled water with U. S. P. Riboflavin Reference Standard, previously dried for 24 hours in vacuum over sulfuric acid, containing, in the same volume of solution, 95, 105, and 120 per cent of the quantity of riboflavin represented in the Tablets taken for

the assay. If the solution of the Tablets is filtered, the solution of the controls should also be filtered through a sintered glass filter. The greenish yellow color of the solution obtained with the Tablets, when viewed transversely against a white background, is not lighter than the control made with 95 per cent, and not darker than the control made with 120 per cent of the U. S. P. Riboflavin Reference Standard. Comparisons must be made in matched tubes. The color comparisons may also be made in suitable colorimeters.

Storage—Preserve Riboflavin Tablets in tight containers.

Sizes—Riboflavin Tablets usually available contain the following amounts of riboflavin: 1 and 5 mg. ($\frac{1}{60}$ and $\frac{1}{12}$ grain).

AVERAGE DOSE OF RIBOFLAVIN—Metric, 5 mg.—Apothecaries,
 $\frac{1}{12}$ grain.

TABELLÆ SACCHARINI SODICI

Saccharin Sodium Tablets

Tab. Saccharin. Sod.—Soluble Saccharin Tablets

Saccharin Sodium Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of soluble saccharin ($C_7H_4O_3NSNa \cdot 2H_2O$), including all tolerances (see page 2).

Identification—Dissolve a quantity of Saccharin Sodium Tablets, equivalent to about 1 Gm. of saccharin sodium, in 10 cc. of distilled water, filter if necessary, and add to the solution 5 cc. of diluted hydrochloric acid: a white precipitate of saccharin is formed. Collect the precipitate on a filter, wash it with small portions of cold distilled water until the washings are practically free of chloride, then dry at about 100° C. The saccharin so obtained does not melt below 222° C., and responds to *identification tests A and B* under *Saccharinum*, page 394.

Ammonium salts—Warm a solution of a quantity of powdered Saccharin Sodium Tablets, equivalent to about 0.3 Gm. of saccharin sodium in 5 cc. of distilled water with 3 cc. of sodium hydroxide T.S.: the odor of ammonia is not noticeable.

Assay—Weigh a counted number of not less than 20 Saccharin Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.4 Gm. of saccharin sodium, and transfer it completely to a 500-cc. Kjeldahl flask with the aid of 40 cc. of distilled water. Add 25 cc. of hydrochloric acid, and boil under a reflux condenser for 1 hour. Cool, dilute with 100 cc. of distilled water, connect the flask with a condenser and a receiver containing exactly 40 cc. of tenth-normal sulfuric acid, add 100 cc. of 30 per cent sodium hydroxide solution, and distil until about 150 cc. of distillate has been collected. Cool the distillate if necessary, and titrate the excess acid with tenth-normal sodium hydroxide, using methyl red T.S. as indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.02412 Gm. of $C_7H_4O_3NSNa \cdot 2H_2O$.

Storage—Preserve Saccharin Sodium Tablets in well-closed containers.

Sizes—Saccharin Sodium Tablets usually available contain the following amounts of saccharin sodium: 15, 30, and 60 mg. ($\frac{1}{4}$, $\frac{1}{2}$, and 1 grain).

AVERAGE DOSE OF SACCHARIN SODIUM—Metric, 30 mg.—
Apothecaries, $\frac{1}{2}$ grain.

NOTE—One 30 mg. ($\frac{1}{2}$ grain) Saccharin Sodium Tablet, as a sweetening agent, is equivalent to approximately 30 Gm. of sucrose.

TABELLÆ SODII NITRITIS**Sodium Nitrite Tablets****Tab. Sod. Nitrit.**

Sodium Nitrite Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of sodium nitrite (NaNO_2), including all tolerances (see page 2).

Identification—A filtered aqueous solution of Sodium Nitrite Tablets responds to the test for sodium, page 592, and for nitrite, page 591.

Assay—Weigh a counted number of not less than 20 Sodium Nitrite Tablets, dissolve them in about 100 cc. of distilled water in a beaker, and filter the solution into a 200-cc. volumetric flask. Wash the beaker and filter with several portions of distilled water into the flask, then add sufficient distilled water to the flask to make exactly 200 cc., and mix well. Transfer a volume of the solution, equivalent to about 0.35 Gm. of sodium nitrite, to a 200-cc. volumetric flask. Add 15 cc. of a saturated solution of potassium chlorate and 40 cc. of tenth-normal silver nitrate, accurately measured, and follow with 5 cc. of nitric acid. Add distilled water to the 200-cc. mark, mix well, and allow the precipitate to settle. Filter the mixture through a dry filter into a dry flask, rejecting the first 20 cc. of filtrate, and titrate the excess of silver nitrate in 100 cc. of the subsequent filtrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.0207 Gm. of NaNO_2 .

If more than 0.1 per cent of chloride (Cl) is present, correct the assay as follows: Transfer to a 200-cc. volumetric flask the same volume of the tablet solution as was used in the assay, dilute, if necessary, with distilled water to about 50 cc., add 30 cc. of tenth-normal silver nitrate, accurately measured, then 5 cc. of nitric acid. Heat the mixture on a steam bath until no more nitrous fumes are evolved and the solution is colorless. Cool, dilute with distilled water to the 200-cc. mark, and mix well. Filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Titrate the excess of silver nitrate in 100 cc. of the subsequent filtrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator, and deduct the volume of tenth-normal silver nitrate consumed in this test from the volume consumed in the assay.

Storage—Preserve Sodium Nitrite Tablets in tight containers.

Sizes—Sodium Nitrite Tablets usually available contain the following amounts of sodium nitrite: 30 and 60 mg. ($\frac{1}{2}$ and 1 grain).

AVERAGE DOSE OF SODIUM NITRITE—Metric, 60 mg.—Apothecaries, 1 grain.

TABELLÆ SODII SALICYLATIS**Sodium Salicylate Tablets****Tab. Sod. Salicyl.**

Sodium Salicylate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of sodium salicylate ($\text{NaC}_7\text{H}_5\text{O}_3$), including all tolerances (see page 2).

Identification—

A: Digest a quantity of powdered Sodium Salicylate Tablets, equivalent to about 1 Gm. of sodium salicylate, with 20 cc. of distilled water, and filter. The filtrate responds to the flame test for sodium, page 592, and to the tests for salicylate, page 592.

B: To 10 cc. of the filtrate obtained in test A, add a slight excess of diluted hydrochloric acid, collect the precipitate of salicylic acid on a filter, wash it with small portions of cold distilled water until the washings are free from chloride, and dry at about 80° C. The salicylic acid so obtained melts between 157° and 160° C., page 595.

Assay—Weigh a counted number of not less than 20 Sodium Salicylate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered Tablets, equivalent to about 0.3 Gm. of sodium salicylate, and transfer it to a separator with the aid of 25 cc. of distilled water. Add 2 cc. of diluted hydrochloric acid, and extract the liberated salicylic acid with several portions of 20 cc. each of ether. Transfer the ether solution to a flask, and evaporate the ether with the aid of a current of air, taking care not to volatilize any of the salicylic acid. Add 3 cc. of neutralized alcohol to dissolve all of the salicylic acid, then add 15 cc. of distilled water, and titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.01601 Gm. of $\text{NaC}_7\text{H}_5\text{O}_3$.

NOTE—This assay is applicable to uncoated Tablets. For coated Tablets a modification of this assay or another suitable assay method may be necessary.

Storage—Preserve Sodium Salicylate Tablets in well-closed containers.

Sizes—Sodium Salicylate Tablets usually available contain the following amounts of sodium salicylate: 0.3 and 0.6 Gm. (5 and 10 grains).

AVERAGE DOSE OF SODIUM SALICYLATE—Metric, 0.6 Gm.—
Apothecaries, 10 grains.

TABELLÆ STRYCHNINÆ SULFATIS

Strychnine Sulfate Tablets

Tab. Strych. Sulf.

Strychnine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of strychnine sulfate [$(\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2)_2 \cdot \text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$] for tablets of 20 mg. or more; and not less than 90 per cent and not more than 110 per cent for tablets of less than 20 mg., including all tolerances (see page 2).

Identification—

A: Finely powder a number of the Tablets, equivalent to about 1 mg. of strychnine sulfate, and moisten thoroughly with ammonia T.S. Add 5 cc. of chloroform and triturate well for 5 minutes. Decant the chloroform through a small filter into an evaporating dish and evaporate to dryness on a steam bath. The residue responds to test C under *Strychninæ Sulfas*, page 435.

B: A filtered, aqueous solution of Strychnine Sulfate Tablets responds to the test for sulfate, page 592.

Assay—Weigh a counted number of not less than 20 Strychnine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.1 Gm. of strychnine sulfate, and transfer it to a 100-cc. volumetric flask. Add 40 cc. of distilled water and 50 cc. of diluted sulfuric acid, shake the mixture occasionally during 2 hours, and allow to stand over night. Dilute to 100 cc. with distilled water, mix thoroughly, and filter through an asbestos pad in a Gooch crucible or a sintered glass crucible. Transfer to a separator an accurately measured portion of the filtrate, equivalent to about 50 mg. of strychnine sulfate, render the solution strongly alkaline with ammonia T.S., and completely extract the strychnine with successive 20-cc. portions of chloroform (at least six extractions will usually be required). Combine the chloroform extracts, and for each 50 cc. of the chloroform add 10 cc. of dehydrated alco-

hol, and evaporate the mixture to about 2 cc., but not to dryness. Add 5 cc. of neutral alcohol and exactly 25 cc. of fiftieth-normal sulfuric acid, and heat on a water bath until the odor of chloroform is no longer perceptible. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.008570 Gm. of $(C_{21}H_{22}N_2O_2)_2 \cdot H_2SO_4 \cdot 5H_2O$.

NOTE—This assay is applicable to uncoated Tablets. For coated Tablets a modification of this assay or another suitable assay method may be necessary.

Storage—Preserve Strychnine Sulfate Tablets in well-closed containers.

Sizes—Strychnine Sulfate Tablets usually available contain the following amounts of strychnine sulfate: 0.6, 1, 1.2, 1.7, and 2 mg. ($\frac{1}{100}$, $\frac{1}{60}$, $\frac{1}{50}$, $\frac{1}{40}$, and $\frac{1}{30}$ grain).

AVERAGE DOSE OF STRYCHNINE SULFATE—Metric, 2 mg.—

Apothecaries, $\frac{1}{30}$ grain.

TABELLÆ SULFANILAMIDI

Sulfanilamide Tablets

Tab. Sulfanilamid.

Sulfanilamide Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of sulfanilamide ($C_6H_5N_2O_2S$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Sulfanilamide Tablets, equivalent to about 0.5 Gm. of sulfanilamide, with 10 cc., then with 5 cc. of chloroform, discarding the chloroform. Macerate the residue with 15 cc. of acetone, filter, evaporate the filtrate on a steam bath with the aid of a current of air, and dry the residue at about 80° C. The sulfanilamide so obtained melts between 164.5° and 166.5° C., page 595, and responds to the *identification tests* under *Sulfanilamidum*.

Assay—Weigh a counted number of not less than 20 Sulfanilamide Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.4 Gm. of sulfanilamide, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of distilled water. Cool to 15° C., and add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped in the titrated solution is streaked on a smear of starch iodide paste T.S. Each cc. of tenth-molar sodium nitrite is equivalent to 0.01722 Gm. of $C_6H_5N_2O_2S$.

Storage—Preserve Sulfanilamide Tablets in well-closed containers.

Sizes—Sulfanilamide Tablets usually available contain the following amounts of sulfanilamide: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF SULFANILAMIDE—Metric, 2 Gm.—Apothecaries, 30 grains.

TABELLÆ SULFAPYRIDINI

Sulfapyridine Tablets

Tab. Sulfapyridin.

Sulfapyridine Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of sulfapyridine ($C_{11}H_{11}N_3O_2S$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Sulfapyridine Tablets, equivalent to about 0.5 Gm. of sulfapyridine, with two 5-cc. portions of chloroform, and discard the chloroform. Triturate the residue with 10 cc. of ammonia T.S. for 5 minutes, add 10 cc. of distilled water, and filter. Warm the filtrate until most of the ammonia is expelled, cool, and add acetic acid to a distinctly acid reaction: a precipitate of sulfapyridine is formed. Collect the precipitate on a filter, wash it well with cold distilled water, and dry at about 80° C. The sulfapyridine so obtained melts between 191° and 193° C., page 595, and responds to the *identification tests A, B, and C* under *Sulfapyridinum*, page 439.

Assay—Weigh a counted number of not less than 20 Sulfapyridine Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.5 Gm. of sulfapyridine, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of distilled water. Cool to 15° C., add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped in the solution is streaked on a smear of starch iodide paste T.S. Each cc. of tenth-molar sodium nitrite is equivalent to 0.02493 Gm. of $C_{11}H_{11}N_3O_2S$.

Storage—Preserve Sulfapyridine Tablets in well-closed containers.

Sizes—Sulfapyridine Tablets usually available contain the following amounts of sulfapyridine: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF SULFAPYRIDINE—Metric, 2 Gm.—Apothecaries, 30 grains.

TABELLÆ SULFATHIAZOLI

Sulfathiazole Tablets

Tab. Sulfathiazol.

Sulfathiazole Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of sulfathiazole ($C_9H_9N_3O_2S_2$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Sulfathiazole Tablets, equivalent to about 0.5 Gm. of sulfathiazole, with two 5-cc. portions of chloroform, and discard the chloroform. Triturate the residue with 10 cc. of ammonia T.S. for 5 minutes, add 10 cc. of distilled water, and filter. Warm the filtrate until most of the ammonia is expelled, cool, and add acetic acid to a distinctly acid reaction: a precipitate of sulfathiazole is formed. Collect the precipitate on a filter, wash it well with cold distilled water, and dry at about 120° C. The sulfathiazole so obtained melts between 200° and 204° C., page 595, and responds to *identification tests A, B, and C* under *Sulfathiazolum*, page 443.

Assay—Weigh a counted number of not less than 20 Sulfathiazole Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 0.5 Gm. of sulfathiazole, and transfer it to a beaker or a casserole. Add 5 cc. of hydrochloric acid and 50 cc. of distilled water. Cool to 15° C., and add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced in a few seconds when a glass rod dipped in the solution is streaked on a smear of starch iodide paste T.S. Each cc. of tenth-molar sodium nitrite is equivalent to 0.02553 Gm. of $C_9H_9N_3O_2S_2$.

Storage—Preserve Sulfathiazole Tablets in well-closed containers.

Sizes—Sulfathiazole Tablets usually available contain the following amounts of sulfathiazole: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF SULFATHIAZOLE—Metric, 2 Gm.—Apothecaries, 30 grains.

TABELLÆ THEOPHYLLINÆ

Theophylline Tablets

Tab. Theophyll.

Theophylline Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of theophylline ($C_7H_8N_4O_2 \cdot H_2O$), including all tolerances (see page 2).

Identification—Triturate a quantity of finely powdered Theophylline Tablets, equivalent to about 0.5 Gm. of theophylline, with 10- and 5-cc. portions of purified benzin, and discard the purified benzin. Triturate the residue with two 10-cc. portions of a mixture of equal volumes of ammonia T.S. and distilled water, and filter each time. Evaporate the combined filtrates to about 5 cc., neutralize if necessary with acetic acid, using litmus paper, then cool to about 15° C., with stirring. Collect the precipitate on the filter, wash it well with cold distilled water, and dry at about 100° C. The theophylline so obtained melts between 270° to 274° C., and responds to the *identification tests* under *Theophyllina*, page 497.

Assay—Place 20 Theophylline Tablets in a 200-cc. volumetric flask, add 50 cc. of distilled water, and when the tablets have disintegrated add 50 cc. of ammonia T.S. Shake until no more dissolves, then add distilled water to the 200-cc. mark, mix well, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured aliquot of the filtrate, equivalent to about 0.25 Gm. of theophylline, to a 250-cc. Erlenmeyer flask, then add exactly 20 cc. of tenth-normal silver nitrate, and allow to stand for 1 hour. Filter through a filtering crucible with the aid of a vacuum, and wash the precipitate three times with 10-cc. portions of distilled water. Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01982 Gm. of $C_7H_8N_4O_2 \cdot H_2O$.

Storage—Preserve Theophylline Tablets in well-closed containers.

Sizes—Theophylline Tablets usually available contain the following amounts of theophylline: 0.1 and 0.2 Gm. ($1\frac{1}{2}$ and 3 grains).

AVERAGE DOSE OF THEOPHYLLINE—Metric, 0.2 Gm.—
Apothecaries, 3 grains.

TABELLÆ THEOPHYLLINÆ

ÆTHYLENEDIAMINICÆ

Theophylline Ethylenediamine Tablets

Tab. Theophyll. Æthylenediam.—Aminophylline Tablets

Theophylline Ethylenediamine Tablets contain an amount of anhydrous theophylline ($C_7H_8N_4O_2$) corresponding to not less than 73 per cent and not more than 84 per cent of the labeled amount of theophylline ethylenediamine, including all tolerances (see page 2).

Identification—Macerate a quantity of Theophylline Ethylenediamine Tablets, equivalent to about 0.5 Gm. of theophylline ethylenediamine, with 25 cc. of distilled water, and filter: the filtrate is alkaline to litmus. Add to the filtrate 1 cc.

of diluted hydrochloric acid: a precipitate of theophylline is formed. Collect the precipitate on a filter, wash it well with small portions of cold water, and dry at about 100° C. The theophylline so obtained melts between 270° to 274° C., and responds to *identification tests A and B* under *Theophyllina*, page 497.

Assay—Place 20 Theophylline Ethylenediamine Tablets in a 200-cc. volumetric flask, add 50 cc. of distilled water and 15 cc. of ammonia T.S., and allow to stand for 30 minutes with frequent shaking. Dilute to 200 cc. with distilled water, mix well, and filter through a dry filter to a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured aliquot, equivalent to about 0.3 Gm. of theophylline ethylenediamine, into a 250-cc. Erlenmeyer flask, and add 8 cc. of ammonia T.S. and exactly 20 cc. of tenth-normal silver nitrate. Allow to stand for 1 hour, then filter through a filtering crucible with the aid of a vacuum, and wash the precipitate three times with 10-cc. portions of distilled water. Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01802 Gm. of anhydrous theophylline ($C_7H_8N_4O_2$).

Storage—Preserve Theophylline Ethylenediamine Tablets in tight containers.

Sizes—Theophylline Ethylenediamine Tablets usually available contain the following amounts of theophylline ethylenediamine: 0.1 and 0.2 Gm. ($1\frac{1}{2}$ and 3 grains).

AVERAGE DOSE OF THEOPHYLLINE ETHYLENEDIAMINE—Metric,
0.2 Gm.—Apothecaries, 3 grains.

TABELLÆ THEOPHYLLINÆ ET SODII ACETATIS

Theophylline and Sodium Acetate Tablets

Tab. Theophyll. et Sod. Acet.

Theophylline and Sodium Acetate Tablets contain an amount of anhydrous theophylline ($C_7H_8N_4O_2$) corresponding to not less than 53 per cent and not more than 67 per cent of the labeled amount of theophylline and sodium acetate, including all tolerances (see page 2).

Identification—Macerate a quantity of powdered Theophylline and Sodium Acetate Tablets, equivalent to about 1 Gm. of theophylline, with 20 cc. of distilled water and 1 cc. of ammonia T.S., and filter. Neutralize the clear filtrate to litmus paper with normal hydrochloric acid: a white precipitate of theophylline is formed. Cool, collect the precipitate on a filter washed with small portions of cold water until free of chloride, and dry at about 100° C. The theophylline so obtained melts between 270° to 274° C., and responds to *identification test A* under *Theophyllina*, page 497. To 5 cc. of the first filtrate from the precipitate of the theophylline, add 3 cc. of alcohol and 0.5 cc. of sulfuric acid, and boil gently: the odor of ethyl acetate is evolved.

Assay—Place 20 Theophylline and Sodium Acetate Tablets in a 200-cc. volumetric flask, add 50 cc. of distilled water and 10 cc. of ammonia T.S., and allow to stand with frequent shaking for 30 minutes or until no more dissolves. Dilute to 200 cc. with distilled water, mix well, and filter. Transfer an accurately measured aliquot of the filtrate, equivalent to about 0.35 Gm. of theophylline and sodium acetate tablets, to a 250-cc. Erlenmeyer flask, and add 8 cc. of ammonia T.S. and exactly 20 cc. of tenth-normal silver nitrate. Allow to stand for 1 hour, then filter through a filtering crucible with the aid of a vacuum, and wash the precipitate three times with 10-cc. portions of distilled water. Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal

ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01802 Gm. of anhydrous theophylline ($C_7H_8N_4O_2$).

Storage—Preserve Theophylline and Sodium Acetate Tablets in tight containers.

Sizes—Theophylline and Sodium Acetate Tablets usually available contain the following amounts of theophylline and sodium acetate: 0.1 and 0.2 Gm. ($1\frac{1}{2}$ and 3 grains).

AVERAGE DOSE OF THEOPHYLLINE AND SODIUM ACETATE—
Metric, 0.2 Gm.—Apothecaries, 3 grains.

TABELLÆ THIAMINÆ HYDROCHLORIDI

Thiamine Hydrochloride Tablets

Tab. Thiamin. Hydrochlor.—Thiamin Chloride Tablets, Vitamin B₁ Tablets

Thiamine Hydrochloride Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of thiamine hydrochloride ($C_{12}H_{17}ClN_4OS.HCl$), including all tolerances (see page 2).

Identification—

A: Triturate a quantity of powdered Thiamine Hydrochloride Tablets, equivalent to about 10 mg. of thiamine hydrochloride, with 10 cc. of distilled water, and filter. To 2 cc. of the filtrate add 2 cc. of half-normal sodium hydroxide and 0.2 cc. of potassium ferricyanide T.S. and 2 cc. of isobutyl alcohol. Shake the mixture vigorously for 2 minutes, and allow the liquids to separate. When illuminated by light entering from above and viewed at a right angle, the upper meniscus of the top layer shows a vivid blue fluorescence. The fluorescence disappears when the mixture is slightly acidified, but reappears when it is again made alkaline.

B: Separate 2-cc. portions of the filtrate from the preceding test yield a red brown precipitate with iodine T.S., a white precipitate with mercuric chloride T.S., and respond to *identification tests B and D* under *Thiaminæ Hydrochloridum*, page 500.

Assay—Weigh a counted number of not less than 20 Thiamine Hydrochloride Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to 10.0 mg. of thiamine hydrochloride, and dissolve it in sufficient distilled water, acidulated with hydrochloric acid (1 cc. of normal hydrochloric acid for each 100 cc. of water), to make exactly 500 cc., and mix well. Measure exactly 5 cc. of the solution into a 50-cc. glass-stoppered cylinder, and add 5 cc. of distilled water and 10 cc. of alcohol-phenol T.S. Add 2 drops of thymol blue pH indicator, mix well, and add to the solution normal sodium hydroxide to produce a distinct blue color. Immediately add 25 cc. of freshly prepared diazotized *p*-aminoacetophenone T.S., mix well, and allow to stand for 2 hours in a dark place. Then add from a pipette exactly 15 cc. of xylene, and shake vigorously for 3 minutes. Allow the liquids to separate, and transfer exactly 10 cc. of the xylene solution to a Nessler tube. Prepare concurrently control tests with U. S. P. Thiamine Hydrochloride Reference Standard, previously dried in a vacuum over sulfuric acid for 24 hours, using amounts of the reference standard equivalent to 95, 105, and 120 per cent of the quantity of the thiamine hydrochloride represented in the Tablets taken for the assay. The color of the xylene solution obtained with the tablets, when viewed transversely against a white background, is not lighter than the control made with 95 per cent and not darker than the control made with 120 per cent of the U. S. P. Thiamine Hydrochloride Refer-

ence Standard. Comparisons must be made in matched tubes. The color comparison may also be made in suitable colorimeters.

Storage—Preserve Thiamine Hydrochloride Tablets in tight containers.

Sizes—Thiamine Hydrochloride Tablets usually available contain the following amounts of thiamine hydrochloride: 3, 5, and 10 mg. ($\frac{1}{20}$, $\frac{1}{12}$, and $\frac{1}{6}$ grain).

AVERAGE DOSE OF THIAMINE HYDROCHLORIDE—Metric, 5 mg.—
Apothecaries, $\frac{1}{12}$ grain.

TABELLÆ THYROIDEI

Thyroid Tablets

Tab. Thyroid.

Thyroid Tablets contain an amount of iodine (I) equivalent to not less than 0.17 per cent and to not more than 0.23 per cent of the labeled amount of thyroid, including all tolerances (see page 2).

Assay—Weigh a counted number of not less than 20 Thyroid Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 1 Gm. of thyroid, and place it in a 100 to 125-cc. nickel crucible. Add 5 cc. of alcohol and 10 cc. of 30 per cent aqueous sodium hydroxide solution and 10 Gm. of anhydrous sodium carbonate, mix thoroughly with a glass rod, leave the rod in the crucible, and add about 2 Gm. of shredded filter paper. Dry the crucible with its contents at 115° C., then place the crucible in a muffle furnace pre-heated to a temperature of from 525° to 550° C., and maintain this temperature for 20 minutes. Cool, add 30 cc. of distilled water, heat to boiling, and decant through an 18 to 19-cm. filter into a 500-cc. flask. Repeat the extraction with another 20-cc. portion of distilled water, then wash the crucible and the char on the filter with hot distilled water until the filtrate measures approximately 200 cc. Slowly add to the warm filtrate 10 cc. of bromine T.S., mix well, and allow to stand for 5 minutes. Cautiously add 50 cc. of phosphoric acid (1 in 2), and boil until a piece of starch potassium iodide test paper is no longer colored blue by the vapors. During the boiling, add, if necessary, distilled water from time to time to maintain the volume at not below 200 cc. Add about 2 mg. of salicylic acid, wash down the sides of the flask with about 5 cc. of distilled water, and cool to room temperature. Add 5 cc. of phosphoric acid and 5 cc. of an aqueous solution of potassium iodide (1 in 10), mix, and immediately titrate the liberated iodine with two-hundredth normal sodium thiosulfate, adding 3 cc. of starch T.S. as indicator as the end-point is neared. Perform a blank determination with the same quantities of the reagents, and in the same manner, and make any necessary correction. Each cc. of two-hundredth normal sodium thiosulfate is equivalent to 0.1058 mg. of iodine (I).

Storage—Preserve Thyroid Tablets in tight containers, preferably at a temperature not above 30° C.

Sizes—Thyroid Tablets usually available contain the following amounts of thyroid: 15, 30, 60, and 120 mg. ($\frac{1}{4}$, $\frac{1}{2}$, 1, and 2 grains).

AVERAGE DOSE OF THYROID—Metric, 60 mg.—Apothecaries,
1 grain.

TALCUM PURIFICATUM

Purified Talc

Talc. Purif.

Purified Talc is a purified, native, hydrous magnesium silicate, sometimes containing a small proportion of aluminum silicate.

Description—Purified Talc is a very fine white or grayish white, crystalline powder. It is unctuous, adhering readily to the skin, and is free from grittiness.

Identification—Mix 0.5 Gm. of Purified Talc with about 0.2 Gm. of anhydrous sodium carbonate and 2 Gm. of anhydrous potassium carbonate, and heat the mixture in a platinum crucible until fusion is complete. Cool, and transfer the fused mixture to a dish or beaker with the aid of about 50 cc. of hot distilled water. Add hydrochloric acid to the liquid until it ceases to cause effervescence, then add 10 cc. more of the acid, and evaporate the mixture to dryness on a water bath. Cool, add 20 cc. of distilled water, boil, and filter the mixture: an insoluble residue of silica remains. Dissolve in the filtrate about 2 Gm. of ammonium chloride, and add 5 cc. of ammonia T.S. Remove by filtration any precipitate which may form, and add sodium phosphate T.S. to the filtrate: a white, crystalline precipitate of magnesium ammonium phosphate separates.

Loss on ignition—When ignited at a red heat, Purified Talc loses not more than 5 per cent of its weight.

Acid-soluble substances—Digest 1 Gm. of Purified Talc with 20 cc. of diluted hydrochloric acid at 50° C. for 15 minutes, and filter: the residue from 10 cc. of filtrate, evaporated to dryness and ignited to constant weight, is not more than 8 mg.

Reaction and soluble substances—Boil 10 Gm. of Purified Talc with 50 cc. of distilled water for 30 minutes, adding distilled water from time to time to maintain approximately the original volume, and filter. The filtrate is neutral to litmus paper. One-half of this filtrate, when evaporated and dried to constant weight at 110° C., yields not more than 5 mg. of residue.

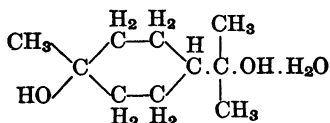
Water-soluble iron—The remaining half of the filtrate obtained in the test for *reaction and soluble substances*, after being slightly acidulated with hydrochloric acid, does not acquire a blue color upon the addition of potassium ferrocyanide T.S.

Storage—Preserve Purified Talc in well-closed containers.

TERPINI HYDRAS

Terpin Hydrate

Terpin. Hyd.



Mol. wt. 190.28

Description—Terpin Hydrate occurs as colorless, lustrous crystals, or as a white powder. It has a slight odor, and is efflorescent in dry air.

Solubility—One Gm. of Terpin Hydrate dissolves in about 200 cc. of water, in 13 cc. of alcohol, in 140 cc. of chloroform, and in about 140 cc. of ether, at 25° C. One Gm. dissolves in 35 cc. of boiling water and in 3 cc. of boiling alcohol.

Melting point—When quickly heated, Terpin Hydrate melts between 115° and 117° C. with the loss of water, page 595.

Identification—Add a few drops of sulfuric acid to a hot, aqueous solution of Terpin Hydrate: the liquid becomes turbid and develops a strongly aromatic odor.

Ash—Terpin Hydrate yields not more than 0.1 per cent of ash, page 556.

Reaction—A hot aqueous solution of Terpin Hydrate (1 in 100) is not acid to litmus.

Residual turpentine—Terpin Hydrate has no odor of turpentine.

Storage—Preserve Terpin Hydrate in tight containers.

TERRA SILICEA PURIFICATA

Purified Siliceous Earth

Ter. Sil. Purif.—Purified Kieselguhr, Purified Infusorial Earth

Purified Siliceous Earth is a form of silica (SiO_2) consisting of the frustules and fragments of diatoms, purified by boiling with diluted hydrochloric acid, washing, and calcining.

Description—Purified Siliceous Earth is an amorphous, very fine, white, light gray or pale buff powder. It is gritty, readily absorbs moisture, and retains about four times its weight of water without becoming fluid.

Identification—Purified Siliceous Earth is insoluble in water, acids, or in dilute solution of the alkali hydroxides.

Loss on ignition—When ignited, Purified Siliceous Earth loses not more than 10 per cent of its weight.

Acid-soluble substances—Digest 1 Gm. of Purified Siliceous Earth for 15 minutes with 20 cc. of diluted hydrochloric acid at 50°C ., and filter. To 10 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate, and ignite to constant weight: the weight of the residue does not exceed 8 mg.

Organic impurities—Ignited Purified Siliceous Earth does not darken appreciably.

Carbonate—Add 1 Gm. of Purified Siliceous Earth to 25 cc. of diluted hydrochloric acid: no effervescence occurs.

Sulfate—Boil the mixture obtained in the test for *carbonate* for 10 minutes, replacing any water lost by evaporation, and filter: the filtrate does not become turbid upon the addition of a few drops of barium chloride T.S.

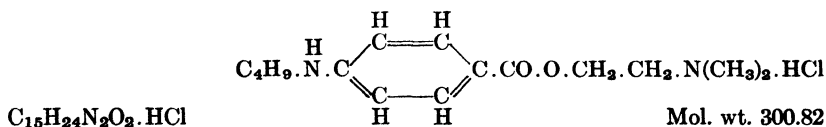
Water-soluble iron and reaction—Boil 10 Gm. of Purified Siliceous Earth with 50 cc. of distilled water during 10 minutes, replace any water lost by evaporation, and filter: the filtrate is colorless and neutral to litmus paper, and, on the addition of 5 drops of potassium ferrocyanide T.S. to 5 cc. of the filtrate, no blue color is produced.

Storage—Preserve Purified Siliceous Earth in well-closed containers.

TETRACAINÆ HYDROCHLORIDUM

Tetracaine Hydrochloride

Tetracain. Hydrochl.



Tetracaine Hydrochloride when dried over sulfuric acid for 18 hours contains not less than 86.5 per cent and not more than 88.5 per cent of tetracaine ($\text{C}_{15}\text{H}_{24}\text{N}_2\text{O}_2$).

Description—Tetracaine Hydrochloride occurs as a fine, white, crystalline, odorless powder. It exhibits a slightly bitter taste followed by a sense of numbness.

Solubility—Tetracaine Hydrochloride is very soluble in water and soluble in alcohol. It is insoluble in ether and in benzene.

Melting point—Tetracaine Hydrochloride melts between 147° and 150° C., page 595.

Identification—

A: Dissolve 0.1 Gm. of Tetracaine Hydrochloride in 10 cc. of distilled water and add 1 cc. of an aqueous solution of potassium thiocyanate (1 in 4): a crystalline precipitate is obtained which, when recrystallized from distilled water and dried at 80° C., melts between 130° and 132° C.

B: A solution of 0.1 Gm. of Tetracaine Hydrochloride in 5 cc. of distilled water responds to the tests for chloride, page 589.

C: Dissolve about 0.1 Gm. of Tetracaine Hydrochloride in 10 cc. of distilled water, add 0.2 cc. of diluted hydrochloric acid and 0.2 cc. of an aqueous solution of sodium nitrite (1 in 10), and gradually add the mixture to a solution of 0.2 Gm. of betanaphthol in 10 cc. of sodium hydroxide T.S.: a white precipitate is formed, but no color develops.

Loss on drying—When dried for 18 hours over sulfuric acid Tetracaine Hydrochloride loses not more than 1 per cent of its weight.

Ash—Tetracaine Hydrochloride yields not more than 0.1 per cent of ash, page 556.

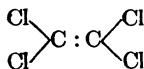
Assay—Transfer about 0.3 Gm. of Tetracaine Hydrochloride, previously dried over sulfuric acid for 18 hours and accurately weighed, to a separator, add 25 cc. of distilled water, make alkaline with sodium hydroxide T.S., and extract with 7 portions of ether using 35 cc., 30 cc., 25 cc., 20 cc., 15 cc., 10 cc., and 10 cc., respectively. Wash the combined ether extracts with 15 cc. of distilled water, filter the ether solution through cotton, and wash the vessel and filter with two 10-cc. portions of ether. Evaporate the combined ether solution of tetracaine to a thick oil with the aid of a current of warm air, and dry to constant weight over sulfuric acid.

Storage—Preserve Tetracaine Hydrochloride in tight, light-resistant containers.

TETRACHLOROÆTHYLENUM

Tetrachloroethylene

Tetrachloroæthylen.—Perchloroethylene, Ethylene Tetrachloride



C_2Cl_4

Mol. wt. 165.85

Tetrachloroethylene contains not less than 99 per cent and not more than 99.5 per cent of C_2Cl_4 , the remainder consisting of alcohol.

Description—Tetrachloroethylene is a clear, colorless, mobile liquid having a characteristic, ethereal odor. It is not inflammable. It is slowly decomposed by light and various metals in the presence of moisture.

Solubility—Tetrachloroethylene is practically insoluble in water. It is miscible with an equal volume of alcohol, with ether, chloroform, petroleum benzin, and benzene, and dissolves most of the fixed and volatile oils.

Specific gravity—The specific gravity of Tetrachloroethylene at 25° C. is between 1.600 and 1.620.

Boiling point—Tetrachloroethylene boils between 118° and 122° C., page 559.

Non-volatile residue—Evaporate 50 cc. of Tetrachloroethylene to dryness in a tared dish on a water bath, and dry the residue to constant weight at 100° C.: the weight of the residue does not exceed 1 mg.

Free acid—In each of two 50-cc. glass-stoppered cylinders of colorless glass, having an internal diameter of 20 mm., place 10 cc. of distilled water, 2 drops of phenolphthalein T.S., and enough hundredth-normal sodium hydroxide to produce, after shaking, pink tints of equal intensity. Into one of the cylinders measure

exactly 20 cc. of Tetrachloroethylene, and again shake thoroughly. Add hundredth-normal sodium hydroxide dropwise shaking well after each addition, until the pink color is reproduced in an intensity equal to that in the cylinder without the Tetrachloroethylene: not more than 0.5 cc. of hundredth-normal sodium hydroxide is required to produce a pink color which persists for 5 minutes.

Chloride ion—Shake 25 cc. of Tetrachloroethylene with an equal volume of distilled water for 5 minutes, and allow the liquids to separate completely. To 10 cc. of the aqueous layer add 5 drops of silver nitrate T.S. and 1 drop of nitric acid: no turbidity results.

Free chlorine—To 10 cc. of the aqueous solution prepared in the test for *chloride*, add 5 drops of starch-potassium iodide T.S.: no blue color is produced.

Readily carbonizable substances—Place 20 cc. of Tetrachloroethylene in a glass-stoppered cylinder which has been previously moistened with sulfuric acid. Add 5 cc. of sulfuric acid, shake vigorously for 5 minutes, and allow the two liquids to separate completely: the acid layer is colorless or shows no more color than matching fluid A, page 563.

Phosgene—Place 20 cc. of Tetrachloroethylene in a glass-stoppered container, and add 0.1 Gm. of benzidine. Stopper the container, and allow to stand in the dark for 24 hours: the solution shows no turbidity or flocculence and is not more deeply colored than matching fluid H, page 563.

Storage—Preserve Tetrachloroethylene in tight, light-resistant containers.

U. S. P. Product of Tetrachloroethylene—Capsulæ Tetrachloroæthyleni.

AVERAGE DOSE—Metric, 3 cc.—Apothecaries, 45 minims.

THEOBROMINA ET SODII ACETAS

Theobromine and Sodium Acetate

Theobrom. et Sod. Acet.

Theobromine and Sodium Acetate is a hydrated mixture of theobromine sodium ($C_7H_7N_4O_2Na$) and sodium acetate ($NaC_2H_3O_2$) in approximately molecular proportions. It yields not less than 55 per cent and not more than 65 per cent of theobromine ($C_7H_8N_4O_2$).

Description—Theobromine and Sodium Acetate is a white, crystalline powder, which is odorless or practically odorless. It has a bitter taste. It is moderately hygroscopic, and on exposure to air it gradually absorbs carbon dioxide with the liberation of free theobromine.

Solubility—One Gm. of Theobromine and Sodium Acetate dissolves in about 1.5 cc. of water at 25° C. It is slightly soluble in alcohol. Even weak acids precipitate the theobromine from the aqueous solution.

Identification—

- A: To about 50 mg. of the precipitate obtained in the *assay* add 1 cc. of hydrochloric acid and about 0.1 Gm. of potassium chlorate, and evaporate to dryness on a water bath: a reddish yellow residue remains which becomes purple when moistened with a drop of ammonia T.S.
- B: When ignited, Theobromine and Sodium Acetate yields a residue which colors a non-luminous flame an intense yellow and effervesces with acids.
- C: To a solution of 0.5 Gm. of Theobromine and Sodium Acetate add 2 cc. of diluted sulfuric acid, and filter: the filtrate responds to the tests for acetate, page 587.

Reaction—An aqueous solution of Theobromine and Sodium Acetate (1 in 20) is alkaline to phenolphthalein T.S.

Alkalinity—Dissolve about 1 Gm. of Theobromine and Sodium Acetate, accurately weighed, in 10 cc. of freshly boiled and cooled distilled water, and titrate the solution with normal hydrochloric acid, using phenolphthalein T.S. as the indicator.

Not more than 3.6 cc. of the hydrochloric acid is required per Gm. of Theobromine and Sodium Acetate.

Color and completeness of solution—A freshly prepared aqueous solution of Theobromine and Sodium Acetate (1 in 20) in freshly boiled and cooled distilled water is colorless or nearly colorless, and is clear or not more than opalescent.

Caffeine—Dissolve 1 Gm. of Theobromine and Sodium Acetate in 10 cc. of distilled water, add a few drops of sodium hydroxide T.S., and shake the mixture with 10 cc. of chloroform. Separate the chloroform layer, evaporate it to dryness on a water bath, and dry for 1 hour at 80° C.: the weight of the residue so obtained does not exceed 5 mg.

Assay—Weigh accurately from 2 Gm. to 2.2 Gm. of Theobromine and Sodium Acetate, and dissolve it in 10 cc. of distilled water. Add to the solution 2 drops of phenolphthalein T.S., then add normal hydrochloric acid until the red color is discharged. The solution should now be slightly alkaline to litmus or should be made so by the addition of 1 or 2 drops of very dilute ammonia T.S. Allow to stand at 20° to 25° C. for 3 hours, stirring occasionally. Transfer the precipitate of theobromine to a tared filtering crucible, wash the precipitate with 4 successive portions of 5 cc. each of ice-cold distilled water, then dry to constant weight at 100° C., and to the weight of theobromine thus obtained add 14 mg. (the quantity of theobromine remaining in the filtrate and washings).

About 0.2 Gm. of the precipitate obtained in the assay leaves only a negligible residue upon ignition.

Storage—Preserve Theobromine and Sodium Acetate in tight, light-resistant containers.

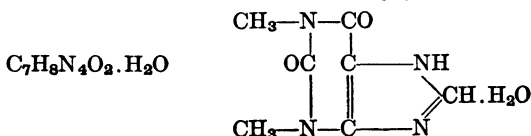
U. S. P. Product of Theobromine and Sodium Acetate—Capsulæ Theobrominæ et Sodii Acetatis.

AVERAGE DOSE—Metric, 0.5 Gm.—Apothecaries, 7½ grains.

THEOPHYLLINA

Theophylline

Theophyll.



$\text{C}_7\text{H}_8\text{N}_4\text{O}_2 \cdot \text{H}_2\text{O}$

Mol. wt. 198.18

Description—Theophylline occurs as a white, crystalline powder, without odor, and having a bitter taste. It is stable in air.

Solubility—One Gm. of Theophylline dissolves in about 120 cc. of water and in about 80 cc. of alcohol, at 25° C. It is more soluble in hot water; sparingly soluble in ether or chloroform. It is freely soluble in solutions of alkali hydroxides and in ammonia.

Melting point—Theophylline melts between 270° and 274° C., page 595.

Identification—

A: To about 10 mg. of Theophylline, contained in a porcelain dish, add 1 cc. of hydrochloric acid and 0.1 Gm. of potassium chlorate, and evaporate to dryness on a water bath: on inverting the dish over a vessel containing a few drops of ammonia T.S. the residue acquires a purple color, which is destroyed by solutions of fixed alkalies.

B: A saturated aqueous solution of Theophylline yields with tannic acid T.S. a precipitate which is soluble in an excess of the reagent.

Loss on drying—When dried to constant weight at 100° C., Theophylline loses not more than 9.5 per cent of its weight.

Ash—Theophylline yields not more than 0.15 per cent of ash, page 556.

Reaction—Dissolve 0.5 Gm. of Theophylline in 75 cc. of distilled water and add 1 drop of methyl red T.S.: not more than 1.0 cc. of fiftieth-normal sodium hydroxide is required to change the red color to yellow.

Carbonizable substances—Dissolve 0.2 Gm. of Theophylline in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Difference from caffeine, theobromine, or paraxanthine—A clear solution is produced when 0.2 Gm. of Theophylline is dissolved in 5 cc. of potassium hydroxide T.S. or in 5 cc. of ammonia T.S.

Storage—Preserve Theophylline in well-closed containers.

U. S. P. Product of Theophylline—Tabellæ Theophyllinæ.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

THEOPHYLLINA ÆTHYLENEDIAMINICA

Theophylline Ethylenediamine

Theophyll. Æthylenediam.—Theophyllina cum Æthylenediamina U. S. P. XI, Theophylline with Ethylene Diamine U. S. P. XI, Aminophylline

Theophylline Ethylenediamine contains not less than 75 per cent and not more than 82 per cent of anhydrous theophylline ($C_7H_8N_4O_2$), and not less than 12.3 per cent and not more than 13.8 per cent of ethylenediamine [$C_2H_4(NH_2)_2$].

Description—Theophylline Ethylenediamine occurs as white or slightly yellowish granules, possessing a slight ammoniacal odor and a bitter taste. It gradually absorbs carbon dioxide from the air with the liberation of free theophylline.

Solubility—One Gm. of Theophylline Ethylenediamine dissolves in about 5 cc. of water, at 25° C., but the solution may become turbid on standing. It is insoluble in alcohol and in ether.

Identification—

A: Dissolve about 1 Gm. of Theophylline Ethylenediamine in 20 cc. of distilled water, add, with constant stirring, 1 cc. of diluted hydrochloric acid, filter, wash the precipitate with small portions of cold distilled water and dry it at 100° C.: the dried precipitate meets the requirements of *identification tests A and B* under *Theophyllina*, page 497.

B: A portion of the precipitate from test A, recrystallized from hot-distilled water and dried at 100° C., melts between 270° and 274° C.

Ash—Theophylline Ethylenediamine yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Theophylline Ethylenediamine is distinctly alkaline to litmus paper.

Assay for theophylline—Place about 0.25 Gm. of Theophylline Ethylenediamine, accurately weighed, in a 250-cc. Erlenmeyer flask, add 50 cc. of distilled water and 8 cc. of ammonia T.S., and gently warm the mixture on a steam bath until complete solution is effected. Add exactly 20 cc. of tenth-normal silver nitrate, mix, and continue to warm on the bath for 15 minutes. Filter through a filtering crucible with the aid of vacuum while still warm, and wash the precipitate three times with 10-cc. portions of distilled water. Cool, acidify the combined filtrate and washings with nitric acid, and add 3 cc. of the acid in excess. Add 2 cc. of ferric-ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.01802 Gm. of anhydrous theophylline ($C_7H_8N_4O_2$).

Assay for ethylenediamine—Dissolve about 0.5 Gm. of Theophylline Ethylenediamine, accurately weighed, in 30 cc. of distilled water. Add a few drops of methyl

orange T.S., and titrate with tenth-normal hydrochloric acid. Each cc. of the tenth-normal acid is equivalent to 0.003005 Gm. of ethylenediamine $[C_2H_4(NH_2)_2]$.
Storage—Preserve Theophylline Ethylenediamine in tight containers.

U. S. P. Products of Theophylline Ethylenediamine—Injectio Theophyllinæ Æthylenediaminicæ, Tabellæ Theophyllinæ Æthylenediaminicæ.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

THEOPHYLLINA ET SODII ACETAS

Theophylline and Sodium Acetate

Theophyll. et Sod. Acet.—Theophyllina cum Sodii Acetate U. S. P. XI, Theophylline with Sodium Acetate U. S. P. XI

Theophylline and Sodium Acetate is a hydrated mixture of theophylline sodium ($C_7H_7N_4O_2Na$) and sodium acetate ($NaC_2H_3O_2$) in approximately molecular proportion. It yields not less than 55 per cent and not more than 65 per cent of anhydrous theophylline ($C_7H_8N_4O_2$).

Description—Theophylline and Sodium Acetate occurs as a white, crystalline powder.

It is odorless, and has a bitter, salty taste. It gradually absorbs carbon dioxide from the air with the liberation of free theophylline.

Solubility—One Gm. of Theophylline and Sodium Acetate dissolves in 25 cc. of water at 25° C.; it is insoluble in alcohol, in ether, and in chloroform.

Identification—

A: Dissolve about 1 Gm. of Theophylline and Sodium Acetate in 20 cc. of warm distilled water, and neutralize with diluted acetic acid: a white crystalline precipitate of theophylline is produced. Filter, wash the precipitate with small portions of cold distilled water, and dry it at 100° C.: the dried precipitate meets the requirements of *identification tests A and B* under *Theophyllina*, page 497.

B: A portion of the precipitate from test A, recrystallized from hot distilled water and dried at 100° C., melts between 270° and 274° C.

C: Suspend about 0.1 Gm. of Theophylline and Sodium Acetate in 2 cc. of alcohol (70 per cent by volume), add 5 drops of sulfuric acid, and boil gently: the mixture evolves the characteristic odor of ethyl acetate.

Reaction—An aqueous solution of Theophylline and Sodium Acetate (1 in 100) is alkaline to phenolphthalein T.S.

Limit of caffeine—Dissolve 0.5 Gm. of Theophylline and Sodium Acetate in 15 cc. of distilled water in a small separator, add 10 cc. of sodium hydroxide T.S., and shake the mixture with 10 cc. of chloroform. Separate the chloroform layer, wash it with 2 cc. of distilled water, evaporate the chloroform in a tared dish on a water bath, and dry the residue at 80° C.: the residue weighs not more than 2.5 mg.

Assay—Proceed as directed for the *Assay* for theophylline under *Theophyllina Æthylenediaminica*, page 498, using about 0.3 Gm. of Theophylline and Sodium Acetate, accurately weighed: the weight of anhydrous theophylline found is not less than 55 per cent and not more than 65 per cent of the weight of Theophylline and Sodium Acetate taken. Each cc. of tenth-normal silver nitrate is equivalent to 0.01802 Gm. of anhydrous theophylline ($C_7H_8N_4O_2$).

Storage—Preserve Theophylline and Sodium Acetate in tight containers.

U. S. P. Product of Theophylline and Sodium Acetate—Tabellæ Theophyllinæ et Sodii Acetatis.

AVERAGE DOSE—Metric, 0.2 Gm.—Apothecaries, 3 grains.

Assay for nitrogen—Weigh accurately about 0.15 Gm. of Thiamine Hydrochloride, previously dried for 24 hours in a vacuum desiccator over sulfuric acid, transfer it to a Kjeldahl flask together with about 0.3 Gm. of benzoic acid, and determine the nitrogen content by the method described on page 598, using 30 cc. of tenth-normal hydrochloric or sulfuric acid to absorb the ammonia and tenth-normal sodium hydroxide to titrate the excess of acid. Each cc. of tenth-normal acid is equivalent to 0.001401 Gm. of N. The nitrogen found corresponds to not less than 16.2 per cent and not more than 16.8 per cent. The digestion with sulfuric acid must be continued for at least 6 hours.

Assay for sulfur—Place 1 Gm. of powdered potassium perchlorate or potassium chlorate, free from lumps, in the bottom of the fusion cup of a Parr peroxide bomb, page 620. Add from 0.28 to 0.30 Gm. of Thiamine Hydrochloride, previously dried over sulfuric acid in a vacuum desiccator for 24 hours and accurately weighed, and 0.2 Gm. of powdered sucrose. Mix the powders intimately with a dry glass rod having a rounded end, and add 15 Gm. of sodium peroxide. Place the cover on the cup, seal the bomb, and mix the contents by thorough shaking for 2 minutes. Ignite the charge, allow 1 minute for complete combustion to take place, and cool the bomb in a stream of cold water, afterwards rinsing the surface with distilled water. Remove the fusion cup and place it in a 400-cc. beaker. Add enough hot distilled water to cover the fusion cup and rinse the cover of the bomb with a jet of hot distilled water, collecting the rinsings in the beaker. Cover the beaker with a watch glass and dissolve the fused mass. When solution is complete, remove the fusion cup, rinse it with a jet of hot distilled water, and add the rinsings to the solution. Cautiously acidify the solution with hydrochloric acid, adding an additional 2 cc. of acid, and dilute with distilled water to about 200 cc. Heat the solution to boiling and add 10 cc. of barium chloride T.S., stirring the solution continuously during the addition. Keep the mixture just below the boiling temperature for 1 hour, stirring frequently. Collect the precipitate upon a quantitative filter paper or in a previously prepared and tared filtering crucible, wash the precipitate with hot distilled water until free from chloride, dry, and ignite to constant weight. The weight of barium sulfate multiplied by 0.1373 represents the quantity of sulfur in the weight of the Thiamine Hydrochloride taken, and corresponds to not less than 9.3 per cent and not more than 9.8 per cent, correction being made for any sulfur derived from the reagents.

Storage—Preserve Thiamine Hydrochloride in tight, light-resistant containers.

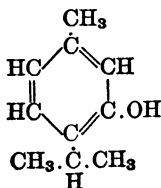
U. S. P. Product of Thiamine Hydrochloride—Tabellæ Thiaminæ Hydrochloridi.

AVERAGE DOSE—Metric, 5 mg.—Apothecaries, $\frac{1}{12}$ grain.

NOTE—Preparations containing thiamine hydrochloride may be assayed as directed under *Thiamine Hydrochloride Assay*, page 623.

THYMOL

Thymol



$\text{C}_{10}\text{H}_{14}\text{O}$

Mol. wt. 150.21

Description—Thymol occurs as colorless crystals, often large, or as a white, crystalline powder. It has an aromatic, thyme-like odor and a pungent taste. It is

affected by light. Thymol is heavier than water, but when liquefied by fusion it is lighter than water.

Solubility—One Gm. of Thymol dissolves in about 1000 cc. of water, in 1 cc. of alcohol, in 1 cc. of chloroform, in 1.5 cc. of ether, and in about 2 cc. of olive oil, at 25° C. It is soluble in glacial acetic acid and in fixed or volatile oils.

Melting point—Thymol melts between 48° and 51° C. but when melted remains liquid at a considerably lower temperature, page 595.

Identification—

A: When Thymol is triturated with about an equal weight of camphor or menthol, the mixture liquefies.

B: Dissolve a very small crystal of Thymol in 1 cc. of glacial acetic acid, and add 6 drops of sulfuric acid and 1 drop of nitric acid: the liquid assumes a deep bluish green color when viewed by reflected light.

C: Heat about 1 Gm. of Thymol in a test tube in a water bath with 5 cc. of a 10 per cent solution of sodium hydroxide: a clear, colorless, or pale red solution is formed, which becomes darker on standing, without the separation of oily drops. Upon the addition of a few drops of chloroform to this solution and agitating the mixture, a violet color is produced.

Non-volatile matter—Volatilize about 2 Gm. of Thymol on a water bath, and dry at 105° C. to constant weight: not more than 0.05 per cent of residue remains.

Reaction—An alcoholic solution of Thymol (1 in 20) is neutral to litmus paper.

Storage—Preserve Thymol in tight, light-resistant containers.

AVERAGE DOSE—Anthelmintic, divided into three doses,
Metric, 2 Gm.—Apothecaries, 30 grains.

THYMOLIS IODIDUM

Thymol Iodide

Thymol. Iodid.

Thymol Iodide is a mixture of iodine derivatives of thymol, principally dithymoldiiodide ($C_6H_2.CH_3.C_3H_7.OI$)₂, containing, when dried over sulfuric acid for 18 hours, not less than 43 per cent of I.

Description—Thymol Iodide occurs as a reddish brown or reddish yellow, bulky powder, with a very slight, aromatic odor. It is affected by light.

Solubility—Thymol Iodide is insoluble in water and in glycerin; slightly soluble in alcohol; readily soluble in chloroform, in ether, in collodion, and in fixed and volatile oils, usually leaving a slight residue. It is insoluble in cold and in hot solutions of the fixed alkali hydroxides:

Identification—When heated with sulfuric acid, Thymol Iodide is decomposed with the separation of iodine.

Loss on drying—When dried over sulfuric acid for 18 hours, Thymol Iodide loses not more than 2 per cent of its weight.

Ash—Heat about 0.5 Gm. of Thymol Iodide, accurately weighed, in a porcelain crucible until charred, cool, add 0.5 cc. of sulfuric acid, and ignite to constant weight: not more than 1.5 per cent of residue remains.

Soluble halides—Digest 0.1 Gm. of Thymol Iodide with 50 cc. of warm distilled water for 10 minutes, filter, cool, and add 5 drops of diluted nitric acid and 1 cc. of silver nitrate T.S.: the turbidity produced, if any, is not greater than that in a control test containing 2 mg. of potassium iodide.

Alkalies, free iodine—Shake 0.5 Gm. of Thymol Iodide with 10 cc. of distilled water, and filter the mixture: the filtrate is not alkaline to litmus paper (*alkalies*) and is not colored blue upon the addition of a few drops of starch T.S. (*free iodine*).

Assay—Mix thoroughly about 0.25 Gm. of Thymol Iodide, previously dried over sulfuric acid for 18 hours and accurately weighed, with about 3 Gm. of anhydrous potassium carbonate. Place the mixture in a platinum crucible, cover with about 1 Gm. of anhydrous potassium carbonate, and heat moderately, gradually increasing the heat but not exceeding a dull redness, until the mass is completely carbonized. Extract the residue with boiling distilled water until the last washing, after acidification with diluted nitric acid, produces no opalescence with silver nitrate T.S. Heat the combined washings, which measure about 150 cc., on a water bath, and add an aqueous solution of potassium permanganate (1 in 20) in small portions, until the hot liquid remains pink. Add just enough alcohol to remove the pink tint, cool to room temperature, dilute to exactly 200 cc., mix well, and filter through a dry filter, rejecting the first 50 cc. of filtrate. To exactly 100 cc. of the subsequent clear filtrate, add about 1 Gm. of potassium iodide (free from iodate) and an excess of diluted sulfuric acid, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. near the end of the titration. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.002115 Gm. of I.

Storage—Preserve Thymol Iodide in tight, light-resistant containers.

THYROIDEUM

Thyroid

Thyroid.

Thyroid is the cleaned, dried, and powdered thyroid gland previously deprived of connective tissue and fat. It is obtained from domesticated animals that are used for food by man.

Thyroid contains not less than 0.17 per cent and not more than 0.23 per cent of iodine in thyroid combination, and must be free from iodine in inorganic or any form of combination other than that peculiar to the thyroid gland. A desiccated thyroid of a higher iodine content may be brought to this standard by admixture with a desiccated thyroid of a lower iodine content or with lactose or sodium chloride.

Description—Thyroid is a yellowish to buff colored, amorphous powder, having a slight, characteristic, meat-like odor and a saline taste.

Identification—When suitably mounted and examined under the microscope, Thyroid shows numerous smooth to striated hyaline fragments of colloid, of angular to irregular shape which are colorless to pale yellow in water mounts, brown in Mallory's stain and pink in eosin solution, some of these fragments containing granules, minute vacuoles, crystalloidal bodies and cells; numerous irregular fragments of follicular epithelium staining brown with Mallory's stain, the individual cells more or less polygonal to rounded-angular or irregularly cuboidal, often with prominent nuclei staining dark blue, their cytoplasm purplish with Delafield's hæmatoxylin; slender glistening segments of capillaries of closely undulate outline; numerous slender segments of neuraxons; numerous aggregates of particles of intercellular substance and slender, mostly straight, connective tissue fibers staining blue to greenish blue with a mixture of Mallory's stain and 1 per cent phosphotungstic acid, the bundles of fibers often appearing reddish in Mallory's stain; few glistening fragments of blood vessels with serrated or crenated ends as viewed in water mounts.

Moisture—Thyroid contains not more than 6 per cent of moisture as determined by the *moisture method by toluene distillation*, page 629.

Assay—Weigh accurately about 1 Gm. of Thyroid into a 100-cc. nickel crucible and add 5 cc. of a saturated solution of sodium hydroxide and 5.0 Gm. of anhydrous

sodium carbonate. Mix thoroughly with a glass stirring rod, leave the rod in the crucible, and add about 1.5 Gm. of shredded filter paper. Dry the crucible and contents at 115° C., then place the crucible in a muffle furnace, preheated to a temperature of 525° to 550° C. and maintain this temperature for 20 minutes. Cool, add 20 cc. of distilled water, heat to boiling and decant through an 18 to 19 cm. filter into a 500-cc. flask. Repeat the extraction with another 20-cc. portion of distilled water, then wash the crucible and the char on the filter with hot distilled water until the filtrate measures approximately 200 cc. Add 7 cc. of bromine T.S., then slowly add 25 cc. of phosphoric acid (1 in 2), and boil until starch-potassium iodide test paper is no longer colored blue by the vapors. Add about 2 mg. of salicylic acid, wash the sides of the flask with 5 cc. of distilled water, and cool to between 20° and 30° C. Add 1 cc. of phosphoric acid and 5 cc. of an aqueous solution of potassium iodide (1 in 10), mix and titrate immediately with two-hundredth-normal sodium thiosulfate, adding 3 cc. of starch T.S. as the indicator when the end-point is neared. Perform a blank test with the same quantities of reagents and in the same manner and make any necessary correction. Each cc. of two-hundredth-normal sodium thiosulfate is equivalent to 0.1058 mg. of iodine (I).
Storage—Preserve Thyroid in a tight container, preferably at a temperature not above 30° C.

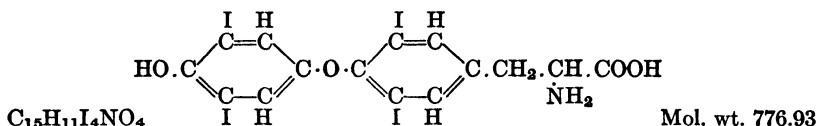
U. S. P. Product of Thyroid—Tabellæ Thyroidei.

AVERAGE DOSE—Metric, 60 mg.—Apothecaries, 1 grain.

THYROXINUM

Thyroxin

Thyrox.



Thyroxin is an active physiological principle obtained from the thyroid gland, or prepared synthetically, and contains, when dried over sulfuric acid for 18 hours, not less than 64 per cent of iodine as an integral part of the Thyroxin molecule.

Description—Thyroxin occurs as white, needle-like, odorless and tasteless crystals. It is affected by light.

Solubility—Thyroxin is insoluble in water, in alcohol, and in the other usual organic solvents, but in the presence of mineral acids or alkalis it dissolves in alcohol. It is soluble in solutions of the alkali hydroxides and in hot solutions of the alkali carbonates. When alkali hydroxide solutions of Thyroxin are saturated with sodium chloride, the sodium salt of Thyroxin separates.

Identification—

- A: Ignite 5 mg. of Thyroxin with 0.1 Gm. of sodium carbonate and dissolve the residue in 2 cc. of distilled water: the solution responds to the tests for iodide, page 590.
- B: Dissolve 5 mg. of Thyroxin in 5 cc. of alcohol containing 4 drops of hydrochloric acid, and add 5 or 6 drops of sodium nitrite solution (1 in 100): the solution develops a yellow color that is increased on heating. On cooling the solution and adding stronger ammonia T.S. until distinctly alkaline, a pink color is produced.

Loss on drying—Dry about 20 mg. of Thyroxin, accurately weighed, over sulfuric acid for 18 hours: the loss in weight is negligible.

Ash—The ash from 10 mg. of Thyroxin is negligible, page 556.

Soluble halides—Shake 10 mg. of Thyroxin with 10 cc. of distilled water during 5 minutes, and filter. Acidify the filtrate with 1 drop of diluted nitric acid, and add 3 drops of tenth-normal silver nitrate: the turbidity so produced is not greater than that produced in a control test by 0.1 cc. of fiftieth-normal hydrochloric acid.

Assay—Mix about 20 mg. of Thyroxin, previously dried over sulfuric acid for 18 hours and accurately weighed, with about 0.5 Gm. of anhydrous potassium carbonate in a small nickel crucible. Cover the mixture with an additional 1 Gm. of anhydrous potassium carbonate, and heat gradually until it is completely decomposed. Treat with distilled water, and transfer it completely to a 100-cc. graduated flask. Heat the solution on a water bath, and add an aqueous solution of potassium permanganate (1 in 20), drop by drop, until the liquid remains pink. Then add, drop by drop, just sufficient alcohol to discharge the pink color, cool to 25° C., and dilute to 100 cc. with recently boiled and cooled distilled water. Mix well, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. To 50 cc. of the subsequent filtrate add about 0.5 Gm. of potassium iodide and 30 cc. of diluted sulfuric acid, and titrate the liberated iodine with two-hundredth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Perform a blank test with the same reagents and in the same manner and make any necessary corrections. Each cc. of two-hundredth-normal sodium thiosulfate is equivalent to 0.1058 mg. of Iodine (I).

Storage—Preserve Thyroxin in tight, light-resistant containers.

AVERAGE DOSE—Metric, 0.5 mg.—Apothecaries, $\frac{1}{120}$ grain.

TINCTURÆ

Tinctures

Tinctures are alcoholic or hydro-alcoholic solutions prepared from animal or vegetable drugs or from chemical substances.

The proportion of drugs represented in the different kinds of tinctures is not uniform but varies according to the established standards for each. Tinctures of potent drugs represent the activity of 10 Gm. of a drug of minimum U. S. P. strength, in each 100 cc. of tincture. When drugs having a higher potency than the minimum are used in preparing tinctures the finished product is assayed and adjusted to the uniform U. S. P. strength. This conforms in principle to the recommendation of the International Protocol as adopted at Brussels, and with international standards. In this group are most of the tinctures which are assayed and adjusted to standards. Most of the other tinctures represent 20 Gm. of the respective drugs in each 100 cc. of tincture. Compound tinctures are made according to long established formulas, and the two official tinctures of fresh drugs are made to represent 50 Gm. of the respective drugs in each 100 cc. of tincture.

The general processes to be employed for the manufacture of tinctures, unless otherwise directed in the individual monographs, are as follows:

Process P. Carefully mix the ground drug or mixture of drugs with a sufficient quantity of the prescribed menstruum to render it evenly and distinctly damp, allow it to stand for 15 minutes, transfer it to a suitable percolator, and pack the drug firmly. Pour on enough of the prescribed menstruum to saturate the drug, cover the top of the percolator, and when the liquid is about to drip from the percolator, close the lower orifice, and allow the drug to macerate for 24 hours or for the time specified in the monograph. If no assay is directed, allow the percolation to proceed slowly, or at the specified rate, gradually adding sufficient menstruum to produce 1000 cc. of tincture, and mix thoroughly. The rate of flow of percolates is defined on page 188.

Modification for Assayed Tinctures. In preparing a tincture which is to be adjusted to a standard, proceed as directed above, but collect only 950 cc. of percolate; mix this thoroughly, and assay a portion of it as directed. Dilute the remainder with such a quantity of the prescribed menstruum as calculation from the assay indicates is necessary to produce a tincture that conforms to the prescribed standard. Mix well.

Process M. Macerate the drug or mixture of drugs in a container which can be closed, in a moderately warm place, with 750 cc. of the prescribed menstruum, agitating it frequently for 3 days or until the soluble matter is dissolved. Transfer the mixture to a filter, and when most of the liquid has drained away, wash the residue on the filter with a sufficient quantity of the prescribed menstruum, combining the filtrates, to produce 1000 cc. of tincture. Mix the product well.

Storage—Preserve Tinctures in tight, light-resistant containers and avoid exposure to direct sunlight and to excessive heat.

TINCTURA AURANTII AMARI

Tincture of Bitter Orange Peel

Tr. Aurant. Amar.

BITTER ORANGE PEEL, in moderately coarse powder...	200 Gm.
To make.....	1000 cc.

Prepare a tincture by Process P, page 506, using a mixture of 2 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug from 12 to 16 hours, and percolate at a moderate rate.

Alcohol content—From 58 to 62 per cent, by volume, of C_2H_5OH .

TINCTURA AURANTII DULCIS**Tincture of Sweet Orange Peel****Tr. Aurant. Dulc.**

SWEET ORANGE PEEL, the outer yellow rind grated or pared from the fresh fruit.....	<u>500 Gm.</u>
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, macerating the drug in 900 cc. of alcohol and completing the preparation with alcohol. Use purified cotton or purified talc as the filtering medium.

Alcohol content—From 73 to 76 per cent, by volume, of C_2H_5OH .

U. S. P. Product of Tincture of Sweet Orange Peel—Syrupus Aurantii.

TINCTURA BALSAMI TOLUTANI**Tincture of Tolu Balsam****Tr. Balsam. Tolu.—Tolu Tincture**

TOLU BALSAM.....	<u>200 Gm.</u>
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, using alcohol as the solvent.

Alcohol content—From 80 to 85 per cent, by volume, of C_2H_5OH .

U. S. P. Product of Tincture of Tolu Balsam—Syrupus Balsami Tolutani.

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

TINCTURA BELLADONNÆ**Tincture of Belladonna****Tr. Bellad.—Tincture of Belladonna Leaf, Tinctura Belladonnæ P.I.**

Tincture of Belladonna yields, from each 100 cc., not less than 0.027 Gm. and not more than 0.033 Gm. of the alkaloids of belladonna leaf.

BELLADONNA LEAF, in moderately coarse powder.....	<u>100 Gm.</u>
To make about.....	1000 cc.

Prepare a tincture by Process P as modified for assayed tinctures, page 506, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Finally adjust the Tincture to contain, in each 100 cc., 0.03 Gm. of the alkaloids of belladonna leaf.

Assay—Measure accurately 100 cc. of Tincture of Belladonna and evaporate it at a temperature not exceeding 100° C., to a volume of about 10 cc. Complete the assay as directed under *Tinctura Hyoscyami*, page 512, beginning with the words "Transfer the concentrated liquid to a separator containing 25 cc. of chloroform . . ." Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of belladonna leaf.

Alcohol content—From 65 to 70 per cent, by volume, of C₂H₅OH.

AVERAGE DOSE—Metric, 0.6 cc.—Apothecaries, 10 minims.

TINCTURA BENZOINI

Tincture of Benzoin

Tr. Benz.

BENZOIN, in moderately coarse powder.....	200 Gm.
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, using alcohol as the solvent.

Alcohol content—From 75 to 83 per cent, by volume, of C₂H₅OH.

TINCTURA BENZOINI COMPOSITA

Compound Tincture of Benzoin

Tr. Benz. Co.

BENZOIN, in moderately coarse powder.....	100 Gm.
ALOE, in moderately coarse powder.....	20 Gm.
STORAX.....	80 Gm.
TOLU BALSAM.....	40 Gm.
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, using alcohol as the solvent.

Alcohol content—From 74 to 80 per cent, by volume, of C₂H₅OH.

TINCTURA CARDAMOMI COMPOSITA

Compound Tincture of Cardamom

Tr. Cardam. Co.

CARDAMOM SEED, in moderately coarse powder.....	20 Gm.
CINNAMON, in fine powder.....	25 Gm.
CARAWAY, in moderately coarse powder.....	12 Gm.
COCHINEAL, in fine powder.....	5 Gm.
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, macerating the mixed powders in 750 cc. of a mixture of 50 cc. of glycerin and 950 cc. of diluted alcohol, and completing the preparation by using first the remainder of the mixture prepared as directed above, and then diluted alcohol.

Alcohol content—From 43 to 47 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

TINCTURA COLCHICI SEMINIS

Tincture of Colchicum Seed

Tr. Colch. Sem.—Tincture of Colchicum, Tinctura Colechici P.I.

Tincture of Colchicum Seed yields, from each 100 cc., not less than 0.036 Gm. and not more than 0.044 Gm. of colchicine.

COLCHICUM SEED, in moderately coarse powder.....	100 Gm.
To make about.....	1000 cc.

Prepare a tincture by Process P as modified for assayed tinctures, page 506, using a mixture of 2 volumes of alcohol and 1 volume of distilled water as the menstruum. Finally adjust the Tincture to contain, in each 100 cc., 0.040 Gm. of colchicine.

Assay—Measure accurately 150 cc. of Tincture of Colchicum Seed, and evaporate it on a water bath to about 15 cc. Cool, dissolve the residue in sufficient distilled water to make exactly 290 cc., add exactly 10 cc. of lead acetate T.S., weigh the flask and contents, and complete the assay as directed under *Colchici Semen*, page 142, beginning with the words "Digest the mixture at a temperature of from 60 to 70° C. for 3 hours."

Alcohol content—From 59 to 63 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

TINCTURA DIGITALIS

Tincture of Digitalis

Tr. Digit.—Tinctura Digitalis P.I.

The potency of Tincture of Digitalis shall be such that, when assayed as directed, 1 cc. of the Tincture shall be equivalent to 1.0 U. S. P. Digitalis Unit, page 150.

Note—The attention of Physicians is called to the fact that U. S. P. XII Tincture of Digitalis is materially reduced in potency when compared with the U. S. P. XI Tincture.

DIGITALIS, in fine powder.....	100 Gm.
To make about.....	1000 cc.

Prepare a tincture by Process P, as modified for assayed tinctures, page 506, using a mixture of 4 volumes of alcohol and 1 volume of water as the menstruum. Finally adjust the Tincture to conform to the required biological standard.

Assay—

The Standard Preparation of Digitalis—Weigh the contents of one ampul of Digitalis Reference Standard to the nearest milligram, either in the original ampul or in a weighing bottle, and transfer to a dry, hard-glass, glass-stoppered container of at least 50-cc. capacity. Complete the weighing within 5 minutes after opening the ampul. Add sufficient menstruum consisting of 4 parts of alcohol, by volume, and 1 part of distilled water, by volume, so that the total volume of menstruum added corresponds to 10 cc. for each Gm. of powder. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 ± 2 hours at $25^\circ \text{C.} \pm 5^\circ$, by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter, centrifuge the mixture and decant into a dry, hard-glass bottle having a tight closure, and preserve under refrigeration until used. Do not use for assay after a period of more than 30 days.

The Cats—Select domestic cats free of gross evidence of disease and weighing between 2.0 and 4.0 Kg. Do not use cats which upon gross examination are either obese, emaciated, lactating, or pregnant. Withhold food for from 16 to 28 hours prior to use. Assign all cats at random with the restriction that the two groups, the one for the standard preparation and the one for the specimen to be assayed, shall not differ by more than 50 per cent in the average of their weights. Lightly anesthetize the cat with ether, and immobilize, preparatory to the injection. Insert a cannula in a femoral vein and arrange to inject the appropriate test dilution from a burette calibrated to 0.1 cc. after insuring the absence of air bubbles from the injection apparatus. Maintain the anesthesia throughout the injection in such a state that pain is absent, the pupillary and corneal reflexes are present, the voluntary musculature is not relaxed, and the cat occasionally moves its tail or makes some other voluntary movement.

Preparation of the Test Dilutions—Dilute the Standard Preparation of Digitalis and the preparation to be assayed in such a way that the estimated fatal dose of each preparation per Kg. of cat will be diluted to 15 cc. with isotonic solution of sodium chloride. Make test dilutions the day they are to be used.

Injection of the Dilutions—Inject 1 cc. of the diluted material for each Kg. of the body weight of the cat, within a few seconds. Repeat this dose at 5-minute intervals until the cat dies from cessation of the heart beat.

Use a total of not less than 6 cats for the Standard Preparation of Digitalis and not less than 6 cats for the preparation to be assayed. If the average number of doses for any given dilution required to produce death is less than 13 or greater than 19, regard these data as preliminary. Use them as a guide, and repeat with a fresh, higher or lower dilution. Complete the assay within a period of 15 days.

Calculation of the Results—Express the lethal dose for each cat in terms of the cc. of tincture per Kg. of live body weight. Find the average lethal dose for the Standard Preparation and for the preparation to be assayed, and compute the standard error for each of the two preparations. If the standard error for either of the two results exceeds 5.7 per cent of the average, repeat the assay of the Standard Preparation or of the preparation to be assayed, as the case may be, or use additional cats until the standard error falls within this limit. Express the potency of the preparation to be assayed in U. S. P. Digitalis Units per cc. by dividing the average for the Standard Preparation by the average for the preparation to be assayed.

To compute the standard error of the average, take the difference between the average and the value found for each cat. Square these differences, take their sum, divide this sum by the number of cats, and divide this quotient by the number of cats diminished by 1. The square root of the last quotient is the standard error of the average.

The formula for the standard error (S.E.) is:

$$\sqrt{\frac{\text{sum } (c - \bar{c})^2}{N(N-1)}}$$

c = fatal dose for each cat.

$\bar{c}$ = average fatal dose for the group of cats.

N = number of cats in the group.

Alcohol content—From 70 to 75 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

TINCTURA GENTIANÆ COMPOSITA

Compound Tincture of Gentian

Tr. Gentian. Co.

GENTIAN, in moderately coarse powder.....	100 Gm.
BITTER ORANGE PEEL, in moderately coarse powder...	40 Gm.
CARDAMOM SEED, in moderately coarse powder.....	10 Gm.
To make.....	1000 cc.

Prepare a tincture by Process P, page 506, packing the mixed drugs lightly and using a mixture of 100 cc. of glycerin, 500 cc. of alcohol, and 400 cc. of water as the first menstruum, and completing the percolation with diluted alcohol. Macerate the drugs from 12 to 16 hours, and then percolate at a moderate rate.

Alcohol content—From 43 to 47 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

TINCTURA HYOSCYAMI

Tincture of Hyoscyamus

Tr. Hyosc.—Tincture of Henbane, Tinctura Hyoscyami P.I.

Tincture of Hyoscyamus yields, from each 100 cc., not less than 0.0034 Gm. and not more than 0.0046 Gm. of the alkaloids of hyoscyamus.

HYOSCYAMUS, in moderately coarse powder.....	100 Gm.
To make about.....	1000 cc.

Prepare a tincture by Process P, as modified for assayed tinctures, page 506, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Finally adjust the Tincture to contain, in each 100 cc., 0.0040 Gm. of the alkaloids of hyoscyamus.

Assay—Measure accurately 250 cc. of Tincture of Hyoscyamus, and evaporate it at a temperature not exceeding $100^{\circ} C.$, to a volume of about 25 cc. Transfer the concentrated liquid to a separator containing 25 cc. of chloroform, rinse the con-

tainer with small portions of diluted alcohol, and add the rinsings to the separator. Add 25 cc. of distilled water, and render the mixture alkaline by the addition of ammonia T.S., then completely extract the alkaloids with successive portions of chloroform. Complete the assay as directed under *Hyoscyamus*, page 218, beginning with the words, "Completely remove the alkaloids from the immiscible solvents by extracting with successive portions of approximately half-normal sulfuric acid . . ." Each cc. of fiftieth-normal acid is the equivalent of 0.005787 Gm. of alkaloids of hyoscyamus.

Alcohol content—From 65 to 69 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

TINCTURA IODI

Tincture of Iodine

Tr. Iodi

Tincture of Iodine is an alcoholic solution of iodine and potassium iodide containing, in each 100 cc., not less than 6.8 Gm. and not more than 7.5 Gm. of I, and not less than 4.7 Gm. and not more than 5.5 Gm. of KI.

Tincture of Iodine may be prepared as follows:

IODINE.....	70 Gm.
POTASSIUM IODIDE.....	50 Gm.
DISTILLED WATER.....	50 cc.
ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the potassium iodide in the distilled water, in a container graduated to 1000 cc., add the iodine, and agitate the mixture until solution is effected. Then add sufficient alcohol to make 1000 cc. of Tincture, and mix thoroughly.

Description—Tincture of Iodine is a transparent liquid having a reddish brown color and the odor of iodine and of alcohol.

Identification—A drop of Tincture of Iodine added to 1 cc. of starch T.S., diluted with 10 cc. of distilled water, produces a deep blue color.

Assay—Place exactly 5 cc. of Tincture of Iodine in a 500-cc. glass-stoppered flask and add 25 cc. of distilled water. Titrate with tenth-normal potassium arsenite, using starch T.S. as the indicator. Each cc. of tenth-normal potassium arsenite is equivalent to 0.01269 Gm. of I. To the titration mixture add 50 cc. of hydrochloric acid and 5 cc. of chloroform, and cool to room temperature. Titrate with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. The last portions of the iodate solution must be added in drops, the mixture being agitated vigorously and continuously. After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, the mixture should be titrated further with the iodate solution. The difference between the number of cubic centimeters of twentieth-molar potassium iodate used and the number of cubic centimeters of tenth-normal potassium arsenite used, multiplied by 0.01660 Gm., equals the number of Gm. of KI in the volume of Tincture taken for the assay.

Storage—Preserve Tincture of Iodine in tight, light-resistant containers, preferably at a temperature not above 25° C.

Alcohol content—From 83 to 88 per cent, by volume, of C_2H_5OH .

TINCTURA IODI MITIS

Mild Tincture of Iodine

Tr. Iodi Mit.

Mild Tincture of Iodine contains, in each 100 cc., not less than 1.8 Gm. and not more than 2.2 Gm. of I, and not less than 2.1 Gm. and not more than 2.6 Gm. of NaI.

Mild Tincture of Iodine may be prepared as follows:

IODINE.....	20 Gm.
SODIUM IODIDE.....	24 Gm.
DILUTED ALCOHOL, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the iodine and sodium iodide in a sufficient quantity of diluted alcohol to make the product measure 1000 cc.

Description—A transparent liquid having a reddish brown color and the odors of iodine and of alcohol.

Identification and assays—Mild Tincture of Iodine conforms to the *test for identification* and the *assays for iodine and for sodium iodide* under *Liquor Iodi*, page 269.

Storage—Preserve Mild Tincture of Iodine in tight containers.

Alcohol content—From 44 to 50 per cent, by volume, of C_2H_5OH .

TINCTURA LAVANDULÆ COMPOSITA

Compound Tincture of Lavender

Tr. Lavand. Co.—Compound Spirit of Lavender

OIL OF LAVENDER.....	8 cc.
OIL OF ROSEMARY.....	2 cc.
CINNAMON, in moderately coarse powder.....	20 Gm.
CLOVE, in moderately coarse powder.....	5 Gm.
MYRISTICA, in moderately coarse powder.....	10 Gm.
RED SAUNDERS, in moderately coarse powder.....	10 Gm.
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, macerating the mixed powders in a mixture of 750 cc. of alcohol, in which the oils have been dissolved, and 250 cc. of water. Complete the preparation with a menstruum of 3 volumes of alcohol and 1 volume of water.

Alcohol content—From 67 to 72 per cent, by volume, of C_2H_5OH .

TINCTURA LIMONIS

Tincture of Lemon

Tr. Limon.—Tinctura Limonis Corticis

LEMON PEEL, the outer yellow rind grated or pared from the fresh fruit.....	500 Gm.
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, macerating the drug in 900 cc. of alcohol and completing the preparation with alcohol. Use purified cotton or purified talc as the filtering medium.

Alcohol content—From 70 to 75 per cent, by volume, of C_2H_5OH .

U. S. P. Product of Tincture of Lemon—Syrupus Acidi Citrici.

TINCTURA MYRRHÆ

Tincture of Myrrh

Tr. Myrrh.

MYRRH, in moderately coarse powder.....	200 Gm.
To make.....	1000 cc.

Prepare a tincture by Process M, page 506, using alcohol as the solvent.

Alcohol content—From 83 to 88 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 2 cc.—Apothecaries, 30 minims.

TINCTURA NUCIS VOMICÆ

Tincture of Nux Vomica

Tr. Nuc. Vom.—Tinctura Strychni P.I.

Tincture of Nux Vomica yields, from each 100 cc., not less than 0.105 Gm. and not more than 0.125 Gm. of strychnine.

NUX VOMICA, in moderately coarse powder.....	100 Gm.
To make about.....	1000 cc.

Prepare a tincture by Process P, as modified for assayed tinctures, page 506. Macerate the drug during 24 hours in a mixture of 7.5 cc. of hydrochloric acid, 150 cc. of alcohol, and 42.5 cc. of distilled water, then percolate slowly, using a mixture of 3 volumes of alcohol and 1 volume of distilled water as the menstruum. Finally adjust the Tincture

by the addition of sufficient of a mixture of 0.8 cc. of hydrochloric acid, 75 cc. of alcohol, and 24.2 cc. of distilled water to make each 100 cc. contain 0.115 Gm. of strychnine. Keep the Tincture at a temperature of 5° C. for 30 minutes, and filter.

Assay—Measure accurately 100 cc. of Tincture of *Nux Vomica* and evaporate it at a temperature not exceeding 100° C., to a volume of about 20 cc. Transfer the concentrated liquid to a separator containing about 30 cc. of chloroform, rinse the container with about 20 cc. of diluted alcohol, and add the rinsings to the separator. Then add 20 cc. of distilled water and 5 cc. of ammonia T.S., and shake the mixture thoroughly for 1 minute. Draw off the separated chloroform solution, and completely extract the alkaloids from the alkaline liquid by shaking it with successive portions of chloroform. Combine the chloroform solutions and complete the *assay* as directed under *Nux Vomica*, page 308, beginning with the words "Add about 40 cc. of approximately normal sulfuric acid." Each cc. of tenth-normal sulfuric acid is equivalent to 0.03344 Gm. of strychnine.

Alcohol content—From 67 to 72 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 1 cc.—Apothecaries, 15 minims.

TINCTURA OPII

Tincture of Opium

Tr. Opii—Laudanum, Tincture of Deodorized Opium, Tinctura opii P.I.

Tincture of Opium yields, from each 100 cc., not less than 0.95 Gm. and not more than 1.05 Gm. of anhydrous morphine.

GRANULATED OPIUM.....	100 Gm.
To make about.....	1000 cc.

Heat 500 cc. of water to boiling, pour it on the granulated opium contained in a suitable vessel, and stir the mixture frequently during 24 hours. Transfer the mixture to a percolator, and, when the liquid has ceased to drop, continue the percolation slowly, using water as the menstruum until the opium is exhausted.

Concentrate the percolate by evaporation until it measures 400 cc. Boil it actively for at least 15 minutes, and then allow it to stand overnight. Then heat the mixture to 80° C., add 50 Gm. of paraffin, and continue the heating until the paraffin is melted. Then beat the mixture thoroughly and set it aside to cool.

Remove the paraffin and rinse it with a few cc. of water, adding the rinsings to the liquid. Filter, and add a sufficient quantity of water through the filter to make the product measure 750 cc. Add 188 cc. of

alcohol to the filtered liquid, and assay a portion of this liquid as directed below. Dilute the remainder of the liquid with such a quantity of a mixture of 1 volume of alcohol and 4 volumes of water as the calculations from the assay indicate is necessary to produce a Tincture containing 1 Gm. of anhydrous morphine in each 100 cc. Mix thoroughly.

Assay—Measure accurately 60 cc. of Tincture of Opium, and evaporate it on a water bath until the alcohol is removed, then add about 20 cc. of distilled water, and mix thoroughly. Transfer the mixture as evenly as possible to a wetted filter of from 10 to 11 cm. in diameter, rinse the container with distilled water, and pour the rinsings upon the filter. Then complete the assay as directed under *Opium*, page 339, line 12, beginning with the words "When the liquid has drained off." The calculated quantity of anhydrous morphine, multiplied by 2.5, is not less than 0.95 Gm. and not more than 1.05 Gm. in each 100 cc. of the Tincture.

Alcohol content—From 17 to 19 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 0.6 cc.—Apothecaries, 10 minims.

TINCTURA OPII CAMPHORATA

Camphorated Tincture of Opium

Tr. Opii Camph.—Paregoric, Tinctura opii benzoica P.I.

Camphorated Tincture of Opium yields, from each 100 cc., not less than 0.035 Gm. and not more than 0.045 Gm. of anhydrous morphine.

TINCTURE OF OPIUM.....	40 cc.
OIL OF ANISE.....	4 cc.
BENZOIC ACID.....	4 Gm.
CAMPHOR.....	4 Gm.
To make.....	1000 cc.

Dissolve the ingredients in 900 cc. of diluted alcohol, add 40 cc. of glycerin, and then sufficient diluted alcohol to make the product measure 1000 cc. Agitate the mixture and filter it.

Camphorated Tincture of Opium may also be prepared as follows:

POWDERED OPIUM.....	4.3 Gm.
OIL OF ANISE.....	3.8 cc.
BENZOIC ACID.....	3.8 Gm.
CAMPHOR.....	3.8 Gm.
To make.....	1000 cc.

Macerate the ingredients for 5 days, with occasional agitation, in a mixture of 900 cc. of diluted alcohol and 38 cc. of glycerin. Then filter, and pass enough diluted alcohol through the filter to obtain 950 cc. of total filtrate. Assay a portion of this filtrate as directed below, and dilute the remainder with a sufficient quantity of diluted alcohol containing, in each 100 cc., 0.4 cc. of oil of anise, 0.4 Gm. of benzoic acid, 0.4 Gm. of camphor, and 4 cc. of glycerin, to produce a Tincture containing, in each 100 cc., 0.04 Gm. of anhydrous morphine.

Assay—Measure accurately 100 cc. of the Tincture, add 2 cc. of approximately normal sulfuric acid, and evaporate the mixture on a water bath to about 10 cc. Transfer the residue to a separator, wash the evaporating dish with portions of about 10 cc. each of a mixture of equal volumes of normal sulfuric acid and distilled water, and add the washings to the separator. Finally, wash the dish with several cc. of a mixture of 85 volumes of chloroform and 15 volumes of alcohol, adding these washings to the liquid in the separator. Add to this mixture about 9 Gm. of sodium chloride, neutralize it to litmus paper by adding stronger ammonia T.S., and then add several drops of the ammonia in excess. Now add 30 cc. of a mixture of 85 volumes of chloroform and 15 volumes of alcohol, shake the contents of the separator, and allow the mixture to separate completely.

Transfer the chloroform layer to a second separator, and extract the aqueous layer with successive portions of 25 cc. each of the chloroform-alcohol mixture until the last extract gives a negative test for morphine with sulfuric acid, containing, in each cc., 1 drop of formaldehyde T.S. Collect the extracts in the second separator. If more than four extractions are required, increase the quantities and volumes of all subsequent reagents to maintain the proportions here prescribed.

Dissolve 25 Gm. of sodium hydroxide in 1000 cc. of distilled water, saturate the solution with sodium chloride, and filter. Remove the morphine from the combined chloroform-alcohol extracts by shaking with several successive, 15-cc. portions of the alkaline salt solution, collecting the latter in a separator. Wash the combined alkaline salt solutions with 10 cc. of chloroform, and discard the chloroform. Neutralize the alkaline salt solution to litmus paper by the addition of hydrochloric acid, and finally add a slight excess of acid. Cool the solution to 25° C., and shake it with 10 cc. of chloroform. Remove the chloroform to another separator, and shake it with 5 cc. of saturated sodium chloride solution, to which a few drops of hydrochloric acid have been added. Discard the chloroform, and add the acid salt solution to the combined acidulated solution.

Now add stronger ammonia T.S. to the solution until it is neutral to litmus paper, and then add a slight excess of the ammonia. Cool the solution to 25° C., and immediately extract the alkaloids with successive portions of the chloroform-alcohol mixture. Filter each extraction into a container through purified cotton, wetted with the chloroform-alcohol mixture, and when completely extracted, discard the liquid in the separator.

Evaporate the combined chloroform solutions on a water bath to a volume of about 1 cc., then add 10 cc. of alcohol, neutral to methyl red T.S., and warm the mixture to dissolve the alkaloids and to remove the last traces of chloroform. Add exactly 20 cc. of fiftieth-normal sulfuric acid, and warm, if necessary, to dissolve the alkaloid completely. Guard against the presence of undissolved particles. Cool, add 15 to 20 cc. of recently boiled and cooled distilled water, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 0.005707 Gm. of anhydrous morphine.

Alcohol content—From 43 to 46 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

TINCTURA RHEI AROMATICA

Aromatic Tincture of Rhubarb

Tr. Rhei Arom.

RHUBARB, in moderately coarse powder.....	200 Gm.
CINNAMON, in moderately coarse powder.....	40 Gm.
CLOVE, in moderately coarse powder.....	40 Gm.
MYRISTICA, in moderately coarse powder.....	20 Gm.
To make.....	1000 cc.

Prepare a tincture by Process P, page 506, using a mixture of 100 cc. of glycerin, 500 cc. of alcohol, and 400 cc. of water as the first menstruum, and diluted alcohol as the second menstruum. Macerate the dampened drugs during 4 hours and then percolate rapidly.

Alcohol content—From 43 to 46 per cent, by volume, of C_2H_5OH .

U. S. P. Product of Aromatic Tincture of Rhubarb—Syrupus Rhei Aromaticus.

AVERAGE DOSE—Metric, 4 cc.—Apothecaries, 1 fluidrachm.

TINCTURA STRAMONII

Tincture of Stramonium

Tr. Stramon.

Tincture of Stramonium yields, from each 100 cc., not less than 0.022 Gm. and not more than 0.028 Gm. of the alkaloids of stramonium.

STRAMONIUM, in moderately coarse powder.....	100 Gm.
To make about.....	1000 cc.

Prepare a tincture by Process P, as modified for assayed tinctures, page 506, using a mixture of 3 volumes of alcohol and 1 volume of distilled water as the menstruum. Percolate the drug at a moderate rate. Finally adjust the Tincture to contain, in each 100 cc., 0.025 Gm. of the alkaloids of stramonium.

Assay—Measure accurately 100 cc. of Tincture of Stramonium and evaporate it, at a temperature not exceeding $100^{\circ} C.$, to a volume of about 10 cc. Complete the assay as directed under *Tinctura Hyoscyami*, page 511, beginning with the words, "Transfer the concentrated liquid to a separator." Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of stramonium.

Alcohol content—From 64 to 70 per cent, by volume, of C_2H_5OH .

AVERAGE DOSE—Metric, 0.75 cc.—Apothecaries, 12 minims.

TOTAQUINA

Totaquine

Totaquin.

Totaquine is a mixture of alkaloids from the bark of *Cinchona succirubra* Pavon and other suitable species of *Cinchona*. It contains not less than 10 per cent of anhydrous quinine, not less than 25 per cent of cinchonidine and anhydrous quinine combined, and a total of not less than 70 per cent of cinchonidine, cinchonine, anhydrous quinidine, and quinine.

Description—Totaquine is a yellowish white to gray, or pale brown powder. It is odorless, has a bitter taste, and is affected by light.

Solubility—Totaquine is almost insoluble in water. It dissolves in warm alcohol and in chloroform, some insoluble residue usually remaining. It is partly soluble in ether.

Identification—

A: Dissolve 0.1 Gm. of Totaquine in 5 cc. of diluted sulfuric acid, and dilute with distilled water to 100 cc.: the solution has a distinct blue fluorescence.

B: Add 2 or 3 drops of bromine T.S. to 5 cc. of the solution from the preceding test, and add 1 cc. of ammonia T.S.: the liquid acquires an emerald green color.

Loss on drying—Weigh accurately about 0.5 Gm. of Totaquine, and dry it for 1 hour at about 70° C., then to constant weight at 100° C.: it loses not more than 5 per cent of its weight.

Ash—Gently ignite about 0.5 Gm. of Totaquine until it is charred, cool, add 1 cc. of sulfuric acid, and ignite to constant weight: the weight of the residue does not exceed 30 mg.

Assay for quinine and cinchonidine—Dissolve 2 Gm. of Totaquine in a mixture of 10 cc. of diluted sulfuric acid, 50 cc. of distilled water, and 40 cc. of alcohol. Heat the solution to boiling, and add to it, drop by drop, dilute ammonia T.S. (1 volume ammonia T.S. with 9 volumes of distilled water) until the solution is just slightly alkaline to litmus. Now add, with stirring, tenth-normal sulfuric acid, drop by drop, until the solution is faintly acid to litmus, and allow it to cool. Filter the solution into a flask, and wash the vessel and filter well with boiling water. Evaporate the combined filtrate and washings to 120 cc., then add to the hot solution, in small portions, 30 Gm. of powdered sodium tartrate, stirring until dissolved, and allow the mixture to stand over night at a temperature between 15° and 20° C.

Transfer the precipitate completely to a tared filter with the aid of about 60 cc. of an aqueous solution of sodium tartrate (1 in 4), then wash it with several 5-cc. portions of ice-cold distilled water, dry at 100° C. for 4 hours, and weigh. (Reserve the filtrate and washings designated as A for the determination of cinchonine and quinidine). The weight of the precipitate of cinchonidine and quinine tartrates so obtained, multiplied by 0.79, represents the weight of cinchonidine and anhydrous quinine, and corresponds to not less than 25 per cent of the Totaquine taken.

Dissolve 0.500 Gm. of the dried precipitate in 3.8 cc. of normal hydrochloric acid and sufficient distilled water to make exactly 25 cc. Add to the solution 20 mg. of activated charcoal, slowly invert the solution three times, and filter at once through a small, dry filter into a dry flask, rejecting the first few cc. of the filtrate; then polarize the filtrate in a 200-mm. tube at 25° C. in sodium light, and calculate the per cent of anhydrous quinine by the following formula:

$$\frac{(M - 322) \times 0.79 \times T}{2.02 \times S}$$

M is the observed angular rotation in minutes, *T* is the weight of the dried tartrate precipitate, and *S* is the weight of the Totaquine taken for the assay.

Assay for cinchonine—Completely transfer filtrate *A* from the assay for quinine and cinchonidine to a separator containing 60 cc. of chloroform and 25 cc. of sodium hydroxide solution (1 in 10), shake well, and allow the liquids to separate. Draw off the chloroform layer into another separator, extract the aqueous layer with two 20-cc. portions of chloroform, and add these chloroform extracts to the main chloroform solution. Discard the aqueous layer. Extract the chloroform solution successively with 15 cc. and 10 cc. of normal sulfuric acid, then with a mixture of 5 cc. of normal sulfuric acid and 5 cc. of distilled water, and finally with three 10-cc. portions of distilled water. Transfer the combined acid solution to a small flask, cool it in ice water, then add 25 cc. of ether and 40 cc. of sodium hydroxide T.S. Stopper the flask tightly, shake gently, and allow to stand for 2 hours at 20° to 25° C. Decant the ether layer with the precipitated cinchonidine through a tared Gooch or filtering crucible, and after the ether layer has all passed through, filter the aqueous layer, using gentle suction. Transfer the ether-aqueous filtrate to a separator, and withdraw the aqueous layer into another separator. Wash the precipitate on the filter with 25 cc. of ether, add these washings to the aqueous layer, shake gently, allow to separate, and add this ether layer to the first. Repeat this operation with another 25 cc. of ether. Reserve the ether filtrates, designated as *B*, for the assay for quinidine. Finally wash the precipitate on the filter with several 5-cc. portions of ice water until the washings are neutral to litmus. Then dry at 100° C. to constant weight. To the weight so obtained add 80 mg. to correct for the solubility of the cinchonine in the ether.

Assay for quinidine—Completely transfer the ether filtrate *B* from the assay for cinchonine to a separator with the aid of a little distilled water and ether. Draw off the aqueous layer, and extract the alkaloid from the ether solution by shaking with four portions of 10 per cent acetic acid (made by diluting 1 volume of glacial acetic acid with 9 volumes of distilled water), using 10 cc., 10 cc., 5 cc., and 5 cc., respectively. Heat the acetic acid solution to boiling, add ammonia T.S. until the solution is neutral or slightly acid to litmus paper, then add 5 Gm. of potassium iodide, stir until it is dissolved, and allow to stand over night at about 20° C. Decant the supernatant liquid through a tared filter, warm the precipitate with 5 cc. of diluted alcohol, and transfer the precipitate completely to the filter with the aid of 5 cc. of diluted alcohol. Dry the precipitate at 100° C. to constant weight. To the weight of the quinidine hydriodide so obtained, add 8 mg. to correct for its solubility in the solvents. The weight of quinidine hydriodide multiplied by 0.717 represents the equivalent weight of quinidine.

Storage—Preserve Totaquine in well-closed, light-resistant containers.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

TOXINUM DIPHTHERICUM DIAGNOSTICUM

Diphtheria Toxin for the Schick Test

Toxin. Diphtheric. Diagnost.—Schick Test Toxin

Diphtheria Toxin for the Schick Test is a sterile solution of the toxic products of growth of the diphtheria bacillus (*Corynebacterium diphtheriæ*). Diphtheria Toxin for the Schick Test complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Diphtheria Toxin for the Schick Test is a transparent liquid containing one-fiftieth of the minimum lethal dose of diphtheria toxin in 0.1 cc. It may be

supplied as diluted toxin ready for administration mixed with a suitable stabilizing diluent or as undiluted toxin accompanied by a vial of diluent suitable for preparing a toxin of the required strength at the time of administration. The minimum lethal dose of Diphtheria Toxin for the Schick Test is defined as the smallest amount of toxin which, administered subcutaneously to a 250- to 280-Gm. guinea pig, will cause the death of the animal within 96 hours after administration. Diphtheria Toxin for the Schick Test must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Diphtheria Toxin for the Schick Test*, the manufacturer's lot number of the Toxin, the name, address, and the license number of the manufacturer, and the date beyond which the Toxin may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Diphtheria Toxin for the Schick Test at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intracutaneous, for determining susceptibility (Schick Test), 0.1 cc. of the dilution, representing one-fiftieth of the minimum lethal dose.

TOXINUM SCARLATINÆ STREPTOCOCCICUM

Scarlet Fever Streptococcus Toxin

Toxin. Scarlat. Streptococ.—Scarlet Fever Streptococcic Toxin,
Scarlet Fever Toxin for Immunization and for the Dick Test

Scarlet Fever Streptococcus Toxin is a sterile solution in a medium containing not more than 1 per cent of peptone but no meat extractive, of certain products including a soluble toxin, resulting from the growth in the broth of suitable strains of hemolytic streptococci (*Streptococcus scarlatinæ*). Scarlet Fever Streptococcus Toxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Scarlet Fever Streptococcus Toxin is a transparent liquid having the color of the medium in which it is made and having a slight odor which is often altered somewhat by the antiseptic used as a preservative.

Regulations—No horse blood or other foreign blood shall be added to the culture medium used for the preparation of the Toxin. Scarlet Fever Streptococcus Toxin must be free from harmful substances detectable by animal inoculation.

The potency of the Toxin shall be expressed in terms of the skin test dose, which is the smallest quantity of Toxin which, injected intracutaneously, will induce positive reactions in any person susceptible to scarlet fever and negative reactions in any person immune to scarlet fever.

The outside label must bear the name *Scarlet Fever Streptococcus Toxin*, the manufacturer's lot number of the Toxin, the name, address, and license number of the manufacturer, and the date beyond which the Toxin may not be expected to retain the potency prescribed by governmental authority.

For active immunization: For this purpose the Toxin shall be dispensed in a series of graduated doses of such potency and number that on the average, when the series has been injected hypodermically at proper intervals, into a toxin-susceptible individual, that individual will not react positively to one skin test dose of the Test Toxin, injected intracutaneously.

Storage—Preserve Scarlet Fever Streptococcus Toxin at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Diagnostic, for determining susceptibility (Dick test), intracutaneous, 0.1 cc. of the dilution, representing one skin test dose. Prophylactic injection, for active immunization, graded hypodermic doses to be given at proper intervals until a negative Dick test is obtained.

TOXITABELLÆ HYDRARGYRI BICHLORIDI MAGNÆ

Large Poison Tablets of Mercury Bichloride

Toxítabel. Hydrarg. Bichlorid. Mag.—Large Corrosive Sublimate Tablets, Large Bichloride Tablets

Large Poison Tablets of Mercury Bichloride contain an average of not less than 0.42 Gm. and not more than 0.52 Gm. of HgCl_2 , with a sufficient quantity of a suitable excipient or diluent.

Large Poison Tablets of Mercury Bichloride must be of a distinctive color, not white; they must be of an angular or irregular shape, not discoid. When sold in small quantities, the Tablets must be dispensed in glass containers of a distinctive, angular shape, having irregular or roughened sides or edges. On the exterior of each container must be placed a red printed label bearing the word "POISON" and a statement indicating the amount of mercury bichloride in each Tablet.

Assay—Proceed as directed under *Hydrargyri Bichloridum*, page 210, using for the assay one-tenth of a mixture prepared by uniformly powdering 10 Tablets. Wash the sulfide with distilled water until the last portion of filtrate is colorless and until a 5-cc. portion of the last washing, acidulated with nitric acid, yields no turbidity on the addition of a few drops of silver nitrate T.S. The weight of the mercuric sulfide obtained, multiplied by 1.167, indicates its equivalent in HgCl_2 .

NOTE—One Large Poison Tablet of Mercury Bichloride added to 475 cc. (1 pint) of water makes a "1 to 1000 solution."

TOXITABELLÆ HYDRARGYRI BICHLORIDI PARVÆ

Small Poison Tablets of Mercury Bichloride

Toxítabel. Hydrarg. Bichlorid. Par.—Small Corrosive Sublimate Tablets,
Small Bichloride Tablets

Small Poison Tablets of Mercury Bichloride contain an average of not less than 0.11 Gm. and not more than 0.14 Gm. of HgCl_2 , with a sufficient quantity of a suitable excipient or diluent.

Small Poison Tablets of Mercury Bichloride must be of a distinctive color, not white; they must be of an angular or irregular shape, not discoid. When sold in small quantities, the Tablets must be dispensed in glass containers of a distinctive, angular shape, having irregular or roughened sides or edges. On the exterior of each container must be placed a red printed label bearing the word "POISON" and a statement indicating the amount of mercury bichloride in each Tablet.

Assay—Proceed as directed under *Hydrargyri Bichloridum*, page 210, using for the assay one-fifth of a mixture prepared by uniformly powdering 20 Tablets. Wash the sulfide with distilled water until the last portion of the filtrate is colorless and until a 5-cc. portion of the last washing, acidulated with nitric acid, yields no turbidity on the addition of a few drops of silver nitrate T.S. The weight of the mercuric sulfide obtained, multiplied by 1.167, indicates its equivalent in HgCl_2 .

NOTE—One Small Poison Tablet of Mercury Bichloride added to 120 cc. (4 fluid-ounces) of water makes a "1 to 1000 solution."

TOXOIDUM DIPHThERICUM

Diphtheria Toxoid

Toxoid. Diphtheric.—Toxinum Diphthericum Detoxicatum U. S. P. XI,
Diphtheria Anatoxin, Anatoxin-Ramon

Diphtheria Toxoid is a sterile aqueous solution of the products of growth of the diphtheria bacillus (*Corynebacterium diphtheriæ*) so modified by special treatment as to have lost the ability to cause toxic effects in guinea pigs but retaining the property of inducing active immunity. The toxicity of the Diphtheria Toxoid shall be so low that five times the initial dose for the adult human does not cause either local or general symptoms of diphtheria poisoning in a guinea pig within 30 days after its injection into the animal. The antigenic value shall be such that the initial dose for the human shall protect at least 80 per cent of guinea pigs, 6 weeks after injection, against five minimum lethal doses each of diphtheria test toxin. Diphtheria Toxoid complies with the require-

ments of the National Institute of Health of the United States Public Health Service.

Description—Diphtheria Toxoid is a clear, brownish yellow, or slightly turbid liquid having a faint, broth-like odor or an odor due to the presence of a preservative. All specimens, not alum precipitated, must be clear. Diphtheria Toxoid must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Diphtheria Toxoid*, the manufacturer's lot number of the Toxoid, the name, address, and license number of the manufacturer, and the date beyond which the Toxoid may not be expected to retain the potency prescribed by governmental authority.

A concentrated Diphtheria Toxoid may be produced in the following form known as:

Diphtheria Toxoid, Alum Precipitated

Refined Diphtheria Toxoid

Alum Precipitated Diphtheria Toxoid is a turbid, white, slightly gray, or slightly pink suspension prepared by adding a sterile aqueous solution of alum to Diphtheria Toxoid, washing the resultant precipitate with isotonic solution of sodium chloride, and resuspending it in isotonic solution of sodium chloride to which a suitable preservative may be added.

Alum Precipitated Diphtheria Toxoid shall be labeled as is required for *Diphtheria Toxoid*, with the additional designation "*Alum Precipitated*" on the labels of the finished package.

It shall meet the requirements as given under Diphtheria Toxoid with the exception of the requirement for antigenicity. It shall also meet the following requirements:

The dose of Alum Precipitated Diphtheria Toxoid for the adult human, when administered subcutaneously to a guinea pig weighing 500 Gm., shall produce at least 2 units of antitoxin per cc. of blood serum at the end of 4 weeks. At least four guinea pigs shall be used for this test, but the blood serum from all of the test animals may be pooled for the test for antitoxic content.

The finished product shall contain not more than 20 mg. of alum per cc., the calculation being based on the total amount of alum added for precipitation.

Storage—Preserve Diphtheria Toxoid at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, 1 cc. to be repeated at proper intervals until a negative Schick test is obtained.

TOXOIDUM TETANICUM

Tetanus Toxoid

Tox. Tet.

Tetanus Toxoid is a sterile solution of the products of growth of the tetanus bacillus (*Clostridium tetani*) so modified by special treatment as to have lost the ability to cause toxic effects in guinea pigs but retaining the property of inducing active immunity.

The toxicity of Tetanus Toxoid shall be so low that 5 cc. of the material does not cause any symptoms of tetanus in a guinea pig within a period of 21 days after its injection into the animal. The antigenic value shall be such that 1 cc. of the material 6 weeks after injection shall protect at least 80 per cent of guinea pigs from all symptoms of tetanus for a period of 10 days after the injection of 10 minimum lethal doses of tetanus test toxin into each animal.

Tetanus Toxoid complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Tetanus Toxoid is a clear, brownish yellow, or slightly turbid liquid having a characteristic odor or an odor due to the presence of a preservative. Tetanus Toxoid must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol if either of these is used), and must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Tetanus Toxoid*, the manufacturer's lot number of the Toxoid, the name, address, and license number of the manufacturer, and the date beyond which the Toxoid may not be expected to retain the potency prescribed by governmental authority.

A concentrated Tetanus Toxoid may be produced in the following form known as:

Tetanus Toxoid, Alum Precipitated

Refined Tetanus Toxoid

Alum Precipitated Tetanus Toxoid is a turbid white or slightly gray suspension prepared by adding a sterile aqueous solution of alum to Tetanus Toxoid, washing the resultant precipitate with isotonic solution of sodium chloride, and resuspending it in isotonic solution of sodium chloride to which a suitable preservative may be added.

Alum Precipitated Tetanus Toxoid shall be labeled as is required for *Tetanus Toxoid*, with the additional designation "*Alum Precipitated*" on the labels of the finished package.

It shall meet the requirements as given under *Tetanus Toxoid* with the exception of the requirement for antigenicity. It shall also meet the following requirements:

The human dose of Tetanus Toxoid, Alum Precipitated, when administered subcutaneously to guinea pigs weighing 500 Gm., shall produce at least 2 units of antitoxin per cc. of blood serum in not more than 6 weeks. At least four guinea pigs shall be used for this test, but the blood serum from all of the test animals may be pooled for the test for antitoxic content.

The finished product shall contain not more than 20 mg. of alum per cc., the calculation being based on the total amount of alum added for precipitation.

Storage—Preserve Tetanus Toxoid at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, 1 cc., to be repeated at proper intervals.

TRAGACANTHA

Tragacanth

Trag.—Gum Tragacanth

Tragacanth is the dried gummy exudation from *Astragalus gummifer* Labillardière, or other Asiatic species of *Astragalus* (Fam. *Leguminosæ*).

Description—

Unground Tragacanth—In flattened, lamellated, frequently curved fragments or in straight or spirally twisted linear pieces from 0.5 to 2.5 mm. in thickness; white to weak yellow, translucent and horny; fracture short; rendered more easily pulverizable by heating to 50° C.; inodorous; taste insipid, mucilaginous.

Histology—Pieces of Tragacanth softened in water and mounted in water or glycerin show numerous lamellæ and a few starch grains.

Powdered Tragacanth—White to yellowish white; angular fragments of mucilage with circular or irregular lamellæ; starch grains from 3 to 25 microns in diameter, mostly simple, spherical to elliptical, with occasional 2- to 4-compound grains, a few of the grains being swollen and more or less altered. The powder shows few or no fragments of lignified vegetable tissue (*Indian gums*).

Identification—Add 1 Gm. of Tragacanth to 50 cc. of distilled water: it swells and forms a smooth, nearly uniform, stiff, opalescent mucilage free from cellular fragments.

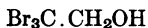
Karaya gum—Boil 1 Gm. of Tragacanth with 20 cc. of distilled water until a mucilage is formed, then add 5 cc. of hydrochloric acid, and again boil the mixture for 5 minutes: no pink or red color is developed.

U. S. P. Product of Tragacanth—Mucilago Tragacanthæ.

TRIBROMOÆTHANOL

Tribromoethanol

Tribromoæth.—Tribromoethyl Alcohol



Mol. wt. 282.79

Tribromoethanol, when dried over sulfuric acid for 18 hours, contains not less than 99 per cent of $\text{C}_2\text{H}_3\text{Br}_3\text{O}$.

Description—Tribromoethanol occurs as a white, crystalline powder, with a slight aromatic odor and taste. It is unstable in air or light. Both aqueous and alcoholic solutions of Tribromoethanol decompose on exposure to light.

Solubility—One Gm. of Tribromoethanol dissolves in about 35 cc. of water at 25° C. It is very soluble in amylene hydrate.

Melting point—Tribromoethanol melts between 79° and 82° C., page 595.

Identification—Dissolve about 0.2 Gm. of Tribromoethanol in 10 cc. of distilled water, add 1 cc. of sodium hydroxide T.S., and heat the solution to 80° C. Render the solution slightly acid with nitric acid, and add a few drops of silver nitrate T.S.: a yellowish, curdy precipitate is formed which is insoluble in nitric acid and soluble only in an excess of stronger ammonia T.S.

Loss on drying—When dried over sulfuric acid for 18 hours, Tribromoethanol loses not more than 1 per cent of its weight.

Ash—Tribromoethanol yields not more than 0.1 per cent of ash, page 556.

Carbonizable substances—Dissolve 0.1 Gm. of Tribromoethanol in 1 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 563.

Reaction—An aqueous solution of Tribromoethanol (1 in 50), prepared at 35° to 40° C. and tested immediately, is not acid to methyl red T.S.

Halogen ions—Dissolve 0.2 Gm. of Tribromoethanol in 10 cc. of distilled water at about 40° C., quickly cool to 25° C., and add 5 drops of diluted nitric acid and 0.5 cc. of silver nitrate T.S.: no immediate opalescence is produced.

Sulfate—Dissolve 0.2 Gm. of Tribromoethanol in 10 cc. of distilled water at about 40° C., quickly cool to 25° C., and add 5 drops of diluted hydrochloric acid and 0.5 cc. of barium chloride T.S.: no turbidity is produced within 5 minutes.

Aldehyde—Dissolve 0.1 Gm. of Tribromoethanol in 5 cc. of distilled water at 35° to 40° C., quickly cool to 25° C., and add 1 cc. of phenylhydrazine acetate T.S.: no precipitate forms within 30 minutes.

Assay—Dissolve about 0.3 Gm. of Tribromoethanol, previously dried over sulfuric acid for 18 hours and accurately weighed, in 20 cc. of sodium hydroxide T.S., and boil gently under a reflux condenser for 2 hours. Rinse the condenser with 20 cc. of distilled water, cool to room temperature, add 20 cc. of diluted nitric acid, 50 cc. of tenth-normal silver nitrate, and 5 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Perform a blank test with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal silver nitrate corresponds to 0.009426 Gm. of $\text{C}_2\text{H}_3\text{Br}_3\text{O}$. Each Gm. of Tribromoethanol consumes not less than 105.0 cc. and not more than 108.0 cc. of tenth-normal silver nitrate.

Storage—Preserve Tribromoethanol in tight, light-resistant containers.

U. S. P. Product of Tribromoethanol—Liquor Tribromoethanolis.

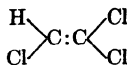
AVERAGE DOSE—Rectal (for each kilogram of body weight)—
Metric, 60 mg.—Apothecaries, 1 grain.

Caution—The total amount administered should not exceed 8 Gm. for women or 10 Gm. for men, regardless of weight.

TRICHLOROÆTHYLENUM

Trichloroethylene

Trichloroæthylen.

 C_2HCl_3

Mol. wt. 131.40

Trichloroethylene contains not less than 99 per cent and not more than 99.5 per cent of C_2HCl_3 , the remainder consisting of alcohol.

NOTE—Ammonium carbonate may be added as a preservative not in excess of 20 mg. per 100 cc.

Description—Trichloroethylene is a clear, colorless, mobile liquid. It has a characteristic odor resembling that of chloroform. It is slowly decomposed by light in the presence of moisture. It is not inflammable.

Solubility—Trichloroethylene is practically insoluble in water. It is miscible with ether, alcohol, and chloroform, and dissolves most fixed and volatile oils.

Specific gravity—The specific gravity of Trichloroethylene at 25° C. is between 1.456 and 1.462.

Boiling point—Trichloroethylene boils between 86° and 88° C., page 559.

Distinction from chloroform and carbon tetrachloride—Transfer 5 cc. of Trichloroethylene to a glass-stoppered cylinder, add 5 cc. of bromine T.S., and shake the mixture vigorously at intervals of 15 minutes: at the end of 1 hour a white, turbid solution forms in the lower layer. Chloroform and carbon tetrachloride remain clear.

Non-volatile residue—Evaporate 50 cc. of Trichloroethylene to dryness in a tared dish on a water bath, and dry the residue at 110° C. for 2 hours: the weight of the residue does not exceed 1 mg.

Free acids—In each of two 50-cc. glass-stoppered cylinders of colorless glass, having an internal diameter of 20 mm., place 10 cc. of distilled water, 2 drops of phenolphthalein T.S., and enough hundredth-normal sodium hydroxide to produce, after vigorous shaking, pink tints of equal intensity. Into one of the cylinders measure exactly 20 cc. of Trichloroethylene and again shake the mixture thoroughly. Add hundredth-normal sodium hydroxide, drop by drop, shaking the mixture well after each addition, until the pink color is reproduced in an intensity equal to that in the cylinder without the Trichloroethylene: not more than 0.5 cc. of hundredth-normal sodium hydroxide is required to produce a pink color which persists for 15 minutes.

Chloride ion—Shake 25 cc. of Trichloroethylene with an equal volume of distilled water for 5 minutes, and allow the liquids to separate completely. Draw off the aqueous layer and to 10 cc. add 5 drops of silver nitrate T.S. and 1 drop of nitric acid: no turbidity results.

Free chlorine—To 10 cc. of the aqueous solution prepared in the test for *chloride ion*, add 5 drops of starch-potassium iodide T.S.: no blue color is produced.

Acetylene—Agitate gently 5 cc. of Trichloroethylene with 2 cc. of silver ammonium nitrate T.S.: no turbidity is observed in either layer within 10 minutes.

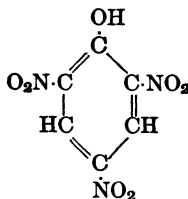
Storage—Preserve Trichloroethylene in sealed, light-resistant ampuls or frangible, light-resistant glass tubes. Avoid prolonged exposure to excessive heat. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Inhalation—Metric, 1 cc.—Apothecaries, 15 minims.

TRINITROPHENOL

Trinitrophenol

Trinitrophen.—Picric Acid



Mol. wt. 229.11

Description—Trinitrophenol occurs as pale yellow prisms or scales. It is odorless and has an intensely bitter taste.

Caution—Trinitrophenol explodes when heated rapidly or when subjected to percussion. For safety in transportation, Trinitrophenol is usually mixed with from 10 to 20 per cent of water.

Before applying the following tests, dry the Trinitrophenol to constant weight over sulfuric acid.

Solubility—One Gm. of Trinitrophenol dissolves in 80 cc. of water, in 12 cc. of alcohol, in 35 cc. of chloroform, and in about 65 cc. of ether, at 25° C. One Gm. dissolves in about 15 cc. of boiling water.

Melting point—Trinitrophenol melts between 121° and 123° C.

Identification—

A: An aqueous solution of Trinitrophenol (1 in 100) has a yellow color, which becomes more intense on the addition of alkalies, and red on the addition of ammonium sulfide T.S. or a solution of an alkaline cyanide.

B: An aqueous solution of Trinitrophenol produces precipitates with solutions of most alkaloidal salts.

Reaction—An aqueous solution of Trinitrophenol is acid to litmus paper.

Sulfate—Add 5 drops of barium chloride T.S. to 10 cc. of an aqueous solution of Trinitrophenol (1 in 100): the liquid does not at once become opalescent.

Insoluble matter—Dissolve 2 Gm. of Trinitrophenol in 50 cc. of benzene, collect the insoluble residue, if any, on a small counterpoised filter, or in a Gooch crucible with an asbestos layer, which has been dried at 100° C. and weighed, and wash the residue and filter with benzene until the last washing is colorless: the residue, dried at 100° C., does not exceed 0.2 per cent.

Storage—Preserve Trinitrophenol in well-closed containers and avoid exposure to excessive heat.

TRITURATIONS

Triturations

Unless otherwise directed, Triturations are to be prepared according to the following formula:

Take of:

THE MEDICINAL SUBSTANCE.....	10 Gm.
LACTOSE, in moderately fine powder.....	90 Gm.
To make.....	100 Gm.

Place the medicinal substance, previously reduced, if necessary, to a moderately fine powder, in a mortar. Add about an equal measure of

Loss on drying—When dried to constant weight at 110° C., Tryparsamide loses not less than 2.5 per cent and not more than 3.5 per cent.

Reaction—An aqueous solution of Tryparsamide (1 in 20) is neutral to litmus paper.

Arsenate—To 1 cc. of an aqueous solution of Tryparsamide (1 in 10) add 1 cc. of magnesia mixture T.S.: no precipitate forms in the cold solution, but on warming the solution a precipitate forms.

Arsanilic acid—To 5 cc. of an aqueous solution of Tryparsamide (1 in 10) add 0.3 cc. of an aqueous solution of sodium nitrite (1 in 10), and cool in ice water. Add 5 cc. of diluted hydrochloric acid and a solution of 0.5 Gm. of betanaphthol in 10 cc. of an aqueous solution of sodium hydroxide (1 in 10): no red color is produced.

Arsphenamine compounds—To 1 cc. of an aqueous solution of Tryparsamide (1 in 10) add 0.2 cc. of ferric chloride T.S.: no blue color is produced but a brown precipitate is obtained which dissolves upon the further addition of ferric chloride T.S.

Assay—Transfer about 0.2 Gm. of Tryparsamide, previously dried to constant weight at 110° C. and accurately weighed, to a 150-cc. Erlenmeyer flask. Add 5 cc. of sulfuric acid, and after the Tryparsamide is thoroughly wetted, add 1 cc. of fuming nitric acid, and heat the flask on a hot plate for 1 hour at about 250° C. Remove the flask from the hot plate, cautiously add 0.5 cc. more of fuming nitric acid, heat again for 5 minutes, and allow to cool slightly. Add about 2 Gm. of powdered ammonium sulfate in divided portions, agitating the flask well until all evolved gas is expelled. Transfer the cool solution, with the aid of distilled water, to a 500-cc. Erlenmeyer flask, and add enough distilled water to measure about 100 cc. Add 1 Gm. of potassium iodide, boil the liquid gently until the volume is reduced to about 40 cc., cool, and, if necessary, cautiously add tenth-normal sodium thiosulfate until the iodine color is completely discharged. Dilute with about 150 cc. of cold distilled water, add sodium hydroxide solution (1 in 5) until the reaction is faintly alkaline to litmus, then add diluted sulfuric acid until the reaction is slightly acid. Add 20 cc. of a cold, saturated aqueous solution of sodium bicarbonate, and titrate with tenth-normal iodine, adding 1 cc. of starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.003746 Gm. of arsenic (As).

Storage—Preserve Tryparsamide in tight containers, preferably at a temperature not above 20° C.

Labeling—The container label must bear the official title, the quantity in grams of the Tryparsamide in the container, the lot number of the product, the name, address, and license number of the manufacturer, and the expiration date for the product.

The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its stability) shall not be more than 5 years from the date of release of that lot by the National Institute of Health.

AVERAGE DOSE—*Caution.* Intravenous, Metric, 2 Gm.—
Apothecaries, 30 grains.

TUBERCULINUM PRISTINUM

Old Tuberculin

Tuberculin. Prist.—Tuberculin-Koch, Concentrated Tuberculin, Crude Tuberculin

Old Tuberculin is a sterile solution in a special liquid culture medium of the soluble products of growth of the tubercle bacillus (*Mycobacterium*

tuberculosis) and should contain about 50 per cent of glycerin. Old Tuberculin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Old Tuberculin is a clear, brownish liquid, readily soluble in water and having a characteristic odor.

Old Tuberculin must be capable of effecting a general and local response in tuberculous guinea pigs. Old Tuberculin must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Tuberculin Old*, the manufacturer's lot number of the Tuberculin, the name, address, and license number of the manufacturer, and the date beyond which the Tuberculin may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Old Tuberculin at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE OF OLD TUBERCULIN—Diagnostic, Intracutaneous—0.000,01 cc. to 0.001 cc.

Therapeutic, Subcutaneous—0.000,000,01 cc. to 0.000,001 cc.

UNGUENTUM ACIDI BORICI

Boric Acid Ointment

Ung. Acid. Bor.—Boracic Acid Ointment

Ointment of Boric Acid contains not less than 9 per cent and not more than 11 per cent of H_3BO_3 .

BORIC ACID, finely powdered.....	10 Gm.
WOOL FAT.....	5 Gm.
WHITE OINTMENT.....	85 Gm.
To make.....	100 Gm.

Levigate the boric acid with the wool fat to a smooth paste, and incorporate the mixture with the white ointment (see page 1).

Assay—Weigh accurately about 5 Gm. of Boric Acid Ointment in a tared Erlenmeyer flask of suitable capacity. Add 30 cc. of hot distilled water, and heat for 15 minutes on a water bath with frequent agitation. Filter while hot through a wetted filter into a 100-cc. volumetric flask. Wash the Erlenmeyer flask with several portions of hot distilled water, filtering the washings into the volumetric flask. Cool, dilute the filtrate with distilled water to exactly 100 cc., and mix well. To exactly 20 cc. of the filtrate, representing one-fifth of the weight of Boric Acid Ointment taken, add 20 cc. of glycerin, previously neutralized to phenolphthalein T.S. Titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Discharge the pink color by the addition of 20 cc. of glycerin, neutral to phenolphthalein T.S., and again titrate until the pink color reappears. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.006184 Gm. of H_3BO_3 .

UNGUENTUM ACIDI TANNICI

Tannic Acid Ointment

Ung. Acid. Tan.

Caution—During its manufacture and storage this Ointment must not come in contact with iron utensils or containers.

TANNIC ACID.....	20 Gm.
GLYCERIN.....	20 Gm.
SODIUM SULFITE.....	0.2 Gm.
YELLOW OINTMENT.....	59.8 Gm.
To make.....	100 Gm.

Dissolve the tannic acid and the sodium sulfite in the glycerin with the aid of gentle heat, and incorporate the solution with the yellow ointment (see page 1).

UNGUENTUM ÆTHYLIS AMINOBENZOATIS

Ethyl Aminobenzoate Ointment

Ung. Æthyl. Aminobenz.

ETHYL AMINOBENZOATE, in very fine powder.....	5 Gm.
WHITE OINTMENT.....	95 Gm.
To make.....	100 Gm.

Incorporate the ethyl aminobenzoate with the white ointment (see page 1).

UNGUENTUM ALBUM

White Ointment

Ung. Alb.—Unguentum U. S. P. XI, Ointment U. S. P. XI, Simple Ointment

WOOL FAT.....	5 Gm.
WHITE WAX.....	5 Gm.
WHITE PETROLATUM.....	90 Gm.
To make.....	100 Gm.

Melt the white wax in a suitable dish on a water bath, add the other ingredients, warm until they are liquefied, then discontinue the heating, and stir the mixture until it congeals (see page 1).

UNGUENTUM AQUÆ ROSÆ

Rose Water Ointment

Ung. Aq. Ros.

SPERMACETI.....	125	Gm.
WHITE WAX.....	120	Gm.
EXPRESSED ALMOND OIL.....	560	Gm.
SODIUM BORATE.....	5	Gm.
ROSE WATER.....	50	cc.
DISTILLED WATER.....	140	cc.
OIL OF ROSE.....	0.2	cc.

To make about..... 1000 Gm.

Reduce the spermaceti and the white wax to small pieces, and melt them on a water bath; add the expressed almond oil, and continue heating until the temperature of the mixture is raised to 70° C. Dissolve the sodium borate in the distilled water and rose water, warmed to the temperature of the melted wax and fat, and gradually add the warm solution to the melted mixture, stirring rapidly and continuously until it has cooled to about 45° C. Then incorporate the oil of rose.

Rose Water Ointment must be free from rancidity. If the Ointment has been chilled, warm it slightly before attempting to incorporate other ingredients with it (see page 1).

Storage—Preserve Rose Water Ointment in collapsible tubes which do not interact physically or chemically with the Ointment so as to alter its quality or purity beyond the official requirements.

UNGUENTUM BELLADONNÆ

Belladonna Ointment

Ung. Bellad.—Unguentum Belladonnæ P.I.

Belladonna Ointment yields not less than 0.110 per cent and not more than 0.140 per cent of the alkaloids of belladonna leaf.

PILULAR EXTRACT OF BELLADONNA.....	10	Gm.
DILUTED ALCOHOL.....	5	cc.
YELLOW OINTMENT.....	85	Gm.

To make about..... 100 Gm.

Triturate the extract with the diluted alcohol until a smooth mixture is obtained, and then incorporate it with the yellow ointment (see page 1).

Assay—Weigh accurately about 20 Gm. of Belladonna Ointment in a tared beaker or other suitable vessel. Add about 40 cc. of warm, approximately half-normal sulfuric acid, and heat the mixture on a water bath for 15 minutes with frequent agitation. Cool until the fatty material separates in a solid layer. Pierce the fat layer, and filter, collecting the filtrate in a separator having a pledget of purified cotton packed loosely in the stem. Repeat this extraction in the same manner until all alkaloids are removed (see *Purification of Alkaloids*, page 604), using successive portions of 40, 30, 20, and 20 cc. of approximately half-normal acid, and filtering each portion into the separator through the filter previously used. Complete the assay as directed under *Hyoscyamus*, page 218, beginning with the words, "Render the combined acid solutions distinctly alkaline with ammonia T.S." Each cc. of fiftieth-normal acid is equivalent to 0.005787 Gm. of the alkaloids of belladonna leaf.

UNGUENTUM CHRYSAROBINI

Chrysarobin Ointment

Ung. Chrysarob.

CHRY SAROBIN.....	6 Gm.
CHLOROFORM.....	7 Gm.
YELLOW OINTMENT.....	87 Gm.
To make.....	100 Gm.

Triturate the chrysarobin with the chloroform, and gradually incorporate the previously melted yellow ointment, stirring until the mixture congeals. So far as possible avoid the loss of chloroform by evaporation (see page 1).

UNGUENTUM FLAVUM

Yellow Ointment

Ung. Flav.

WOOL FAT.....	5 Gm.
YELLOW WAX.....	5 Gm.
PETROLATUM.....	90 Gm.
To make.....	100 Gm.

Melt the yellow wax in a suitable dish on a water bath, add the other ingredients, warm until they are liquefied, then discontinue the heating, and stir the mixture until it congeals (see page 1).

UNGUENTUM HYDRARGYRI AMMONIATI

Ammoniated Mercury Ointment

Ung. Hydrarg. Ammon.—White Precipitate Ointment

Note—The strength of Ammoniated Mercury Ointment has been reduced from 10 Gm. of ammoniated mercury in each 100 Gm. (U. S. P. XI) to 5 Gm. of ammoniated mercury in each 100 Gm.

Ammoniated Mercury Ointment contains an amount of Ammoniated Mercury corresponding to not less than 3.5 per cent and not more than 4.5 per cent of Hg.

AMMONIATED MERCURY, in very fine powder.....	5 Gm.
WOOL FAT.....	5 Gm.
WHITE OINTMENT.....	90 Gm.
To make.....	100 Gm.

Levigate the ammoniated mercury with the wool fat to a smooth paste, and incorporate the mixture with the white ointment (see page 1).

Assay—Place in a separator about 3 Gm. of Ammoniated Mercury Ointment, accurately weighed. Warm it slightly to soften the ointment and while rotating, add 75 cc. of ether, and then shake the mixture until the ointment base is dissolved. Add 10 cc. of a mixture of equal volumes of hydrochloric acid and distilled water and shake it vigorously until all of the ammoniated mercury has dissolved. Filter the aqueous layer that separates into a 250-cc. beaker and wash the remaining ether solution with several portions of 10 cc. each of distilled water until the last washing produces no turbidity with silver nitrate T.S.

Dilute the hydrochloric acid solution and the combined washings to about 150 cc., add 5 cc. of hydrochloric acid, and precipitate with hydrogen sulfide gas. Collect the precipitate in a tared Gooch crucible and wash it successively with distilled water, with two 10-cc. portions of alcohol, two 10-cc. portions of carbon tetrachloride, using no suction, and finally wash with 10 cc. of ether. Dry the crucible and contents to constant weight at 100° C. The weight of mercuric sulfide so obtained, multiplied by 0.862, represents the quantity of mercury in the quantity of the Ointment taken for the assay.

UNGUENTUM HYDRARGYRI FORTE

Strong Mercurial Ointment

Ung. Hydrarg. Fort.—Unguentum Hydrargyri, Mercurial Ointment

Strong Mercurial Ointment contains not less than 47.5 per cent and not more than 52.5 per cent of Hg.

MERCURY.....	500 Gm.
OLEATE OF MERCURY.....	20 Gm.
WOOL FAT.....	300 Gm.
WHITE WAX.....	50 Gm.
WHITE PETROLATUM.....	130 Gm.
To make about.....	1000 Gm.

Triturate the oleate of mercury in a warm mortar, add the mercury gradually, and when all of the mercury is dispersed, set the mixture aside for about 15 minutes. Melt together the wool fat, white wax, and white petrolatum, allow to cool partially, add about 25 Gm. of the wool fat-petrolatum mixture to the mercurial mixture, and continue the trituration until the globules of mercury are no longer visible under a lens magnifying 10 diameters. Then add the remainder of the wool fat-petrolatum mixture, and mix thoroughly.

Assay—Weigh accurately about 0.8 Gm. of Strong Mercurial Ointment, mix it in a suitable flask with 20 cc. of distilled water and 20 cc. of nitric acid, and warm the mixture gently until red fumes cease to be evolved and the solution is colorless. Cool, add 100 cc. of distilled water, filter through a filter paper previously moistened with dilute nitric acid, and wash the filter with warm distilled water. To the combined cooled filtrate and washings add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

U. S. P. Product of Strong Mercurial Ointment—Unguentum Hydrargyri Mite.

UNGUENTUM HYDRARGYRI MITE

Mild Mercurial Ointment

Ung. Hydrarg. Mit.—Diluted Mercurial Ointment, Blue Ointment, Unguentum hydrargyri P.I.

Note—The strength of Mild Mercurial Ointment has been reduced from 30 Gm. of mercury in each 100 Gm. (U. S. P. XI) to 10 Gm. of mercury in each 100 Gm.

Mild Mercurial Ointment contains not less than 9 per cent and not more than 11 per cent of Hg.

STRONG MERCURIAL OINTMENT.....	200 Gm.
WHITE OINTMENT.....	800 Gm.
To make about.....	1000 Gm.

Incorporate the strong mercurial ointment with the white ointment (see page 1).

Assay—Proceed as directed under *Unguentum Hydrargyri Forte*, page 537, using about 4 Gm. of Mild Mercurial Ointment, accurately weighed.

UNGUENTUM HYDRARGYRI OXIDI FLAVI

Yellow Mercuric Oxide Ointment

Ung. Hydrarg. Oxid. Flav.

Caution—During its manufacture and storage this Ointment must not come in contact with metallic utensils or containers except when made of tin or when tin-coated.

Yellow Mercuric Oxide Ointment contains not less than 0.9 per cent and not more than 1.1 per cent of HgO.

YELLOW MERCURIC OXIDE, in very fine powder.....	1 Gm.
LIQUID PETROLATUM.....	1 Gm.
YELLOW OINTMENT.....	98 Gm.
To make.....	100 Gm.

Triturate the yellow mercuric oxide with the liquid petrolatum until the mixture is smooth, and then incorporate the yellow ointment (see page 1).

Assay—Weigh accurately about 10 Gm. of Yellow Mercuric Oxide Ointment, and transfer it, with the aid of 50 cc. of ether, to a small beaker. Stir the mixture thoroughly, then filter through a small, retentive paper filter, keeping the funnel covered with a watch glass during the filtration. Remove any mercuric oxide adhering to the beaker with the aid of small pieces of filter paper, and add these to the filter. Wash the filter with small portions of ether, then allow any ether on the filter to evaporate at room temperature. Carefully fold the filter with the precipitate, and place it in a 500-cc. Kjeldahl flask. Add 15 cc. of sulfuric acid, and gently swirl the flask to wet thoroughly the paper with the acid. Then add cautiously 10 cc. of nitric acid, and mix gently. Insert a small funnel in the neck of the flask, incline the flask at an angle of about 45°, and heat it at first gently, then more strongly, until a colorless or practically colorless solution results. Allow to cool sufficiently, and carefully add through the funnel about 50 cc. of distilled water, rinsing the stem of the funnel with a few cc. of distilled water and allowing the rinsings to run into the flask. Gently boil the solution to expel oxides of nitrogen, then add to the still warm solution potassium permanganate T.S. until a slight pink color persists. Cool, add just sufficient oxalic acid T.S. to discharge the pink color, then add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S. Dilute with about 50 cc. of distilled water, and titrate the cold solution with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 0.01003 Gm. of Hg.

UNGUENTUM IODI

Iodine Ointment

Ung. Iodi

Caution—During its manufacture and storage this Ointment must not come in contact with metallic utensils or containers.

Iodine Ointment contains not less than 6.5 per cent and not more than 7.5 per cent of total iodine (I).

IODINE.....	4 Gm.
POTASSIUM IODIDE.....	4 Gm.
GLYCERIN.....	12 Gm.
YELLOW OINTMENT.....	80 Gm.
To make.....	100 Gm.

Dissolve the iodine and the potassium iodide in the glycerin, preferably in a glass mortar, and incorporate the mixture with the yellow ointment (see page 1).

Assay—Tare a nickel or silver crucible containing about 2 Gm. of anhydrous potassium carbonate, add about 1 Gm. of Iodine Ointment, and reweigh. Cover the Ointment with an additional 2 Gm. of potassium carbonate, and heat on a water bath until the ointment is fluid. Heat the crucible and contents gently over a Bunsen flame, gradually increasing the temperature but not exceeding a dull redness, until the ointment is completely carbonized. Extract the residue with boiling distilled water, and wash on a filter until the last washing, acidified with nitric acid, yields no precipitate with silver nitrate T.S. Heat the combined filtrate and washings, which measure about 75 cc., on a water bath, and add an aqueous solution of potassium permanganate (1 in 20) until the hot liquid remains permanently pink. Add just enough alcohol to remove the pink tint, cool to 25° C., then add sufficient distilled water to make exactly 100 cc. Filter the mixture through a dry filter, rejecting the first 25 cc. of filtrate. To 50 cc. of the subsequent clear filtrate add 10 cc. of potassium iodide T.S., acidify with diluted sulfuric acid, and titrate with tenth-normal sodium thiosulfate. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.002115 Gm. of iodine (I).

UNGUENTUM PHENOLIS

Phenol Ointment

Ung. Phenol.—Ointment of Carbolic Acid

Phenol Ointment contains not less than 1.8 per cent and not more than 2.2 per cent of C_6H_5OH .

PHENOL.....	2 Gm.
YELLOW OINTMENT.....	98 Gm.
To make.....	100 Gm.

Incorporate the phenol with the yellow ointment (see page 1).

Assay—Place about 2 Gm. of Phenol Ointment in a tared, 150-cc. Florence flask, and weigh accurately. Add 75 cc. of distilled water, and arrange the flask for steam distillation, having connected it with a water-chilled condenser. Distill with steam, collecting 150 cc. of distillate in a 500-cc., glass-stoppered flask: 1 cc. of the subsequent distillate shows no turbidity with 3 drops of bromine T.S.

Add exactly 50 cc. of tenth-normal bromine, and proceed with the assay as directed under *Phenol*, page 358, line 4, beginning with the words, "then 5 cc." Each cc. of tenth-normal bromine is equivalent to 0.001569 Gm. of C_6H_5OH .

UNGUENTUM PICIS PINI

Pine Tar Ointment

Ung. Pic. Pin.—Unguentum Picis Liquidæ

PINE TAR.....	50 Gm.
YELLOW OINTMENT.....	50 Gm.
To make	100 Gm.

Incorporate the pine tar with the yellow ointment (see page 1).

UNGUENTUM SULFURIS

Sulfur Ointment

Ung. Sulfur.

Sulfur Ointment contains not less than 13.5 per cent and not more than 16.5 per cent of S.

PRECIPITATED SULFUR.....	15 Gm.
WOOL FAT.....	7 Gm.
WHITE OINTMENT.....	78 Gm.
To make.....	100 Gm.

Levigate the sulfur with the wool fat, and incorporate the mixture with the white ointment (see page 1).

Assay—Place about 0.5 Gm. of Sulfur Ointment in a tared Erlenmeyer flask of suitable capacity, and weigh accurately. Add 5 cc. of nitric acid and 3 cc. of bromine, and heat the mixture gently until the excess of bromine has been dissipated. Add 50 cc. of distilled water, and transfer the mixture to a separator. Extract the liquid with three successive portions of 30, 20, and 10 cc. of ether, respectively, to remove the ether-soluble ingredients. Wash the combined ether extracts with about 10 cc. of distilled water, and add this washing to the aqueous solution. Dilute the aqueous solution to about 200 cc. with distilled water, and acidify with hydrochloric acid. Heat the solution to boiling, and add hot barium chloride T.S. in small portions until no further precipitation takes place. Heat on a water bath for 1 hour, then collect the precipitate on a filter, wash it well with hot distilled water, dry and ignite to constant weight. The weight of the barium sulfate thus obtained, multiplied by 0.1373, indicates its equivalent of S.

UNGUENTUM ZINCI OXIDI

Zinc Oxide Ointment

Ung. Zinc. Oxid.—Zinc Ointment

Zinc Oxide Ointment contains not less than 18.5 per cent and not more than 21.5 per cent of ZnO.

ZINC OXIDE, in very fine powder.....	20 Gm.
WOOL FAT.....	7 Gm.
WHITE OINTMENT.....	73 Gm.
To make.....	100 Gm.

Levigate the zinc oxide with the wool fat to a smooth paste, and incorporate the mixture with the white ointment (see page 1).

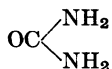
Calcium, magnesium, and other foreign substances—Add to the residue obtained in the assay 6 cc. of diluted hydrochloric acid: no effervescence occurs. Heat the mixture on a steam bath for 10 to 15 minutes: not more than a trace of insoluble residue remains. Filter the solution, dilute the filtrate with distilled water to 10 cc., add ammonia T.S. until the precipitate first formed redissolves, then add 2 cc. each of ammonium oxalate T.S. and sodium phosphate T.S.: not more than a slight turbidity is produced in 5 minutes.

Assay—Weigh accurately in a tared porcelain crucible about 2 Gm. of Zinc Oxide Ointment, heat it gently until melted, and continue the heating, gradually raising the temperature until the mass is thoroughly charred. Ignite the mass strongly until all of the carbonaceous material has been dissipated and the residue is uniformly yellow and the weight is constant. The increase in weight of the crucible represents the quantity of zinc oxide in the weight of the Ointment taken for the assay.

UREA

Urea

Carbamide



Mol. wt. 60.06

Description—Urea occurs as colorless to white, prismatic crystals, or as a white, crystalline powder. It is almost odorless, and has a cooling, saline taste. It may gradually develop a slight odor of ammonia.

Solubility—One Gm. of Urea dissolves in 1.5 cc. of water and in about 10 cc. of alcohol at 25° C. One Gm. dissolves in about 1 cc. of boiling alcohol. It is almost insoluble in chloroform and in ether.

Melting point—Urea melts between 131° and 133° C., page 595.

Identification—

A: Heat about 0.5 Gm. of Urea in a test tube: it liquefies, and ammonia is evolved. Continue the heating until the liquid becomes turbid, then cool. Dissolve the fused mass in a mixture of 10 cc. of distilled water and 1 cc. of an aqueous solution of sodium hydroxide (1 in 10), and add 1 drop of cupric sulfate T.S.: the solution acquires a reddish violet color.

B: Dissolve 0.1 Gm. of Urea in 1 cc. of distilled water, and add 1 cc. of nitric acid: a white crystalline precipitate is produced.

Ash—Urea yields not more than 0.1 per cent of ash, page 556.

Reaction—An aqueous solution of Urea (1 in 10) is neutral to litmus paper.

Chloride—A solution of 2 Gm. of Urea in distilled water shows no more *chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 626.

Sulfate—A solution of 2 Gm. of Urea in distilled water shows no more *sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 626.

Alcohol-insoluble matter—Dissolve 5 Gm. of Urea in 50 cc. of warm alcohol, and if any insoluble residue remains, filter the solution on a tared filter, wash the residue and filter with 20 cc. of warm alcohol, and dry to constant weight at 105° C.: the weight of the residue does not exceed 2 mg.

Heavy metals—Dissolve 1 Gm. of Urea in 20 cc. of distilled water, and add 5 cc. of tenth-normal hydrochloric acid. The heavy metals limit, page 586, for Urea is 20 parts per million.

Storage—Preserve Urea in well-closed containers.

AVERAGE DOSE—Metric, 8 Gm.—Apothecaries, 2 drachms.

VACCINUM RABIES

Rabies Vaccine

Vac. Rabies—Antirabic Vaccine, Antirabic Virus, Pasteur Treatment, Pasteur Prophylactic

Rabies Vaccine is an uncontaminated suspension of the attenuated, diluted, dried or dead, fixed virus of rabies. The virus is obtained from the tissue of the central nervous system of an animal suffering from fixed virus rabies infection. Rabies Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Rabies Vaccine is a more or less turbid, white or whitish liquid, nearly odorless, or having an odor due to the presence of a preservative. Rabies Vaccine must come from animals that are healthy excepting for rabies infection. It must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used). Rabies Vaccine shall be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Rabies Vaccine*, the type of vaccine, the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, the genus of animal employed when other than the rabbit, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Rabies Vaccine at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, the contents of one container, to be repeated at proper intervals.

VACCINUM TYPHOSUM

Bacterial Vaccine made from the Typhoid Bacillus

Vac. Typhos.—Typhoid Prophylactic, Enteric Vaccine, Typhoid Vaccine

Bacterial Vaccine made from the Typhoid Bacillus is a sterile suspension of killed typhoid bacilli (*Eberthella typhosa*), of a strain selected for high antigenic efficiency in isotonic solution of sodium chloride or other suitable diluent. The Vaccine shall contain, in each cc., at least 1,000,000,000 typhoid organisms. Bacterial Vaccine made from the Typhoid Bacillus complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Bacterial Vaccine made from Typhoid Bacillus is a more or less turbid, whitish liquid, nearly odorless, or having a faint odor due to the presence of a preservative. It must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used). It shall be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Bacterial Vaccine made from the Typhoid Bacillus*, and must indicate the number of organisms represented in 1 cc., the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Bacterial Vaccine made from the Typhoid Bacillus at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, 0.5 cc. and 1 cc., the latter dose to be repeated once.

VACCINUM TYPHO-PARATYPHOSUM

Bacterial Vaccine made from the Typhoid Bacillus and the Paratyphoid "A" and "B" Bacilli

Vac. Typho-paratyphos.—Typhoid Combined Vaccine, Typhoid-paratyphoid Combined Vaccine, Typhoid Mixed Vaccine Prophylactic, Typhoid-paratyphoid Prophylactic, Mixed Enteric Vaccine

Bacterial Vaccine made from the Typhoid Bacillus and the Paratyphoid "A" and "B" Bacilli is a suspension in isotonic solution of sodium chloride or other suitable diluent of killed typhoid bacilli (*Eberthella typhosa*) of a strain selected for high antigenic efficiency and killed paratyphoid "A" bacilli (*Salmonella paratyphi*) and killed paratyphoid "B" bacilli (*Salmonella schottmülleri*).

The Vaccine shall contain in 1 cc., at least 1,000,000,000 typhoid organisms and at least 250,000,000 of each of the paratyphoid organisms. Bacterial vaccine made from the Typhoid Bacillus and the Paratyphoid

"A" and "B" Bacilli complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Bacterial Vaccine made from the Typhoid Bacillus and the Paratyphoid "A" and "B" Bacilli is a more or less turbid, whitish fluid; nearly odorless or having a faint odor due to the presence of a preservative. It must be sterile and must not contain an excessive amount of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and shall be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Bacterial Vaccine made from the Typhoid Bacillus and the Paratyphoid "A" and "B" Bacilli*, must indicate the number of each of the organisms represented in 1 cc., the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority.

Storage—Preserve Bacterial Vaccine made from the Typhoid Bacillus and the Paratyphoid "A" and "B" Bacilli at a temperature between 2° and 10° C., preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, 0.5 cc. and 1 cc., the latter dose to be repeated once.

VACCINUM VARIOLÆ

Smallpox Vaccine

Vac. Var.—Virus Vaccinicum, Glycerinated Vaccine Virus, Jennerian Vaccine, Antismallpox Vaccine

Smallpox Vaccine consists of a glycerinated suspension of the vesicles of vaccinia or cowpox which have been obtained from healthy vaccinated animals of the bovine family. The vesicles must be removed and the vaccine must be prepared under aseptic conditions.

The vesicles must be removed from the animal at the time of suitable development, thoroughly triturated and made into a smooth suspension with an aqueous solution of glycerin. This solution must not be acid to bromocresol purple T.S. and not distinctly alkaline to phenol red T.S. Smallpox Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Smallpox Vaccine is a grayish, turbid suspension; it may have an odor and a trace of color due to the presence of a preservative.

The following precautions must be observed in licensed establishments:

No Vaccine shall be prepared from any animal having a communicable disease other than vaccinia. Animals used for propagating Smallpox Vaccine must have responded negatively to a tuberculin test and, prior to vaccination, must have evidenced no ill health while in quarantine for at least 7 days under daily veterinary inspection. After the vaccine pulp has been removed from each animal, a necropsy shall be performed, permanent records of which shall be kept. Smallpox Vaccine shall be free from harmful substances detectable by animal inoculation. Each

lot of Smallpox Vaccine shall be examined to determine its freedom from undue bacterial content, and a special examination shall be made of each lot to determine the absence of tetanus organisms and other pathogenic anaerobes. Permanent records of these examinations must be kept. The finished product must be placed in sterile containers that comply with the requirements of the law and of the regulations established by the United States Public Health Service.

Regulations—The outside label must bear the name *Smallpox Vaccine*, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority. The label must also bear directions concerning storage of the package below 5° C.

Storage—Preserve and dispense Smallpox Vaccine in hermetically sealed, capillary glass tubes.

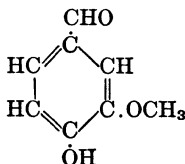
It must be kept at a very low temperature, preferably below 0° C., and never above 5° C. as it loses potency rapidly at higher, even moderate, temperatures.

VANILLINUM

Vanillin

Vanillin.

$C_8H_8O_3$



Mol. wt. 152.14

Description—Vanillin occurs as fine, white to slightly yellow crystals, usually needle-like, having an odor and taste suggestive of vanilla. It is affected by light.

Solubility—One Gm. of Vanillin dissolves in about 100 cc. of water and in about 20 cc. of glycerin, at 25° C. One Gm. dissolves in 20 cc. of water at 80° C. It is freely soluble in alcohol, in chloroform, and in ether.

Melting point—Vanillin melts between 80° and 82° C., page 595.

Identification—

- A: Vanillin is readily dissolved by aqueous solutions of alkali hydroxides, and from these solutions, when not too dilute, it is precipitated at once by the addition of acids.
- B: To 10 cc. of a cold, saturated aqueous solution of Vanillin add 3 to 5 drops of ferric chloride T.S.: a blue color is produced. When this mixture is heated at about 80° C. for a few minutes, the blue color changes to brown, and, when cooled, it deposits a white or nearly white precipitate.
- C: Vanillin is extracted completely from its solution in ether by shaking with a saturated, aqueous solution of sodium bisulfite, from which it is precipitated by acids.
- D: A cold, aqueous solution of Vanillin, when treated with lead subacetate T.S., yields a white precipitate, which is sparingly soluble in hot water but soluble in acetic acid.

Loss on drying—When dried over sulfuric acid for 18 hours, Vanillin loses not more than 1 per cent of its weight.

Ash—Vanillin yields not more than 0.05 per cent of ash, page 556.

Reaction—An aqueous solution of Vanillin is acid to litmus paper.

Storage—Preserve Vanillin in tight, light-resistant containers.

ZINCI ACETAS

Zinc Acetate

Zinc. Acet.



Mol. wt. 219.50

Zinc Acetate contains not less than 82.74 per cent and not more than 87.32 per cent of $(\text{CH}_3\text{.COO})_2\text{Zn}$, corresponding to not less than 99 per cent of the hydrated salt, $(\text{CH}_3\text{.COO})_2\text{Zn} \cdot 2\text{H}_2\text{O}$.

Description—Zinc Acetate occurs as crystals having a pearly luster, a faintly acetous odor, and, in dilute solutions, an astringent, metallic taste. When exposed to air, the crystals gradually effloresce.

Solubility—One Gm. of Zinc Acetate is soluble in 2.5 cc. of water and in 30 cc. of alcohol, at 25° C. It is more soluble in hot solvents.

Identification—An aqueous solution of Zinc Acetate responds to the tests for zinc, page 593, and for acetate, page 587.

Reaction—An aqueous solution of Zinc Acetate (1 in 20) is neutral or slightly acid to litmus paper.

Alkalies or alkaline earths—Dissolve 1 Gm. of Zinc Acetate in 75 cc. of distilled water, add ammonium sulfide T.S. to precipitate the zinc completely, then dilute with distilled water to a volume of 100 cc. Mix well and filter. To 50 cc. of the clear filtrate add 5 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.

Arsenic—An aqueous solution of Zinc Acetate meets the requirements of the test for *arsenic*, page 554.

Heavy metals—The heavy metals limit for Zinc Acetate when determined as described under *Zinci Sulfas*, page 549, is 50 parts per million.

Assay—Dissolve about 1 Gm. of Zinc Acetate, accurately weighed, in about 100 cc. of distilled water. Heat the solution to about 90° C., and add sodium carbonate T.S., drop by drop, to precipitate all of the zinc. Avoid a large excess of sodium carbonate. Boil the mixture for about 5 minutes, and set it aside to allow the precipitate to subside. Collect the precipitate in a tared Gooch crucible, and wash with hot distilled water until the last washing is free from alkali. Dry the residue, ignite, and weigh it. The weight of the zinc oxide thus obtained, multiplied by 2.254, indicates its equivalent of $(\text{CH}_3\text{.COO})_2\text{Zn}$.

Storage—Preserve Zinc Acetate in tight containers.

ZINCI CHLORIDUM

Zinc Chloride

Zinc. Chlorid.



Mol. wt. 136.29

Zinc Chloride contains not less than 95 per cent of ZnCl_2 .

Description—Zinc Chloride occurs as a white, or nearly white, odorless, crystalline powder, or in porcelain-like masses, or moulded in pencils. It is very deliquescent.

Solubility—One Gm. of Zinc Chloride dissolves in 0.5 cc. of water, in about 1.5 cc. of alcohol, and in about 2 cc. of glycerin, at 25° C. Its solution in water or in alcohol is usually slightly turbid but the turbidity disappears upon the addition of a small quantity of hydrochloric acid.

Identification—An aqueous solution of Zinc Chloride responds to the tests for zinc, page 593, and for chloride, page 589.

Reaction—An aqueous solution of Zinc Chloride (1 in 10) is acid to litmus paper.

Oxychloride—Mix an aqueous solution of Zinc Chloride (1 in 20) with an equal volume of alcohol: the addition of 0.3 cc. of normal hydrochloric acid is sufficient to render 10 cc. of the mixture perfectly clear.

Sulfate—One Gm. of Zinc Chloride shows no more *sulfate* than corresponds to 0.3 cc. of fiftieth-normal sulfuric acid, page 626.

Ammonium salts—Add sufficient sodium hydroxide T.S. to 5 cc. of an aqueous solution of Zinc Chloride (1 in 10) to redissolve the precipitate which first forms, and then warm the solution: the odor of ammonia is not perceptible.

Alkalies or alkaline earths—Dissolve 2 Gm. of Zinc Chloride in about 150 cc. of distilled water contained in a 200-cc. volumetric flask. Precipitate the zinc completely by means of ammonium sulfide T.S., and add sufficient distilled water to make the mixture measure 200 cc. Mix well, and filter through a dry filter, rejecting the first portion of the filtrate. To 100 cc. of the subsequent filtrate add 5 drops of sulfuric acid, evaporate to dryness, and ignite: the weight of the residue does not exceed 10 mg.

Heavy metals—The heavy metals limit for Zinc Chloride, when determined as described under *Zinci Sulfas*, page 549, is 50 parts per million.

Assay—Proceed as directed under *Zinci Acetas*, page 546, using about 1 Gm. of Zinc Chloride. The weight of zinc oxide obtained, multiplied by 1.675, indicates its equivalent in $ZnCl_2$.

Storage—Preserve Zinc Chloride in tight containers.

ZINCI OXIDUM

Zinc Oxide

Zinc. oxid.

ZnO

Mol. wt. 81.38

Zinc Oxide, when freshly ignited, contains not less than 99 per cent of ZnO.

Description—Zinc Oxide occurs as a very fine, odorless, amorphous, white or yellowish white powder, free from gritty particles. It gradually absorbs carbon dioxide from air.

Solubility—Zinc Oxide is insoluble in water and in alcohol. It dissolves in dilute acids.

Identification—

A: When strongly heated, Zinc Oxide assumes a yellow color which disappears on cooling.

B: A solution of Zinc Oxide in a slight excess of diluted hydrochloric acid responds to the tests for zinc, page 593.

Loss on ignition—When ignited, Zinc Oxide loses not more than 2 per cent of its weight.

Carbonate—Mix 2 Gm. of Zinc Oxide with 10 cc. of distilled water, add 30 cc. of diluted sulfuric acid, and heat on a water bath, with constant stirring: no effervescence occurs and the resulting solution is clear and colorless.

Alkali—Mix 1 Gm. of Zinc Oxide with 10 cc. of hot distilled water, and add 2 drops of phenolphthalein T.S.: if a red color is produced, not more than 0.3 cc. of tenth-normal hydrochloric acid is required to discharge it.

Arsenic—Dissolve 1 Gm. of Zinc Oxide in 20 cc. of diluted hydrochloric acid: a 5-cc. portion of this solution meets the requirements of the test for *arsenic*, page 554, omitting the treatment with sulfuric and sulfurous acids.

Iron and many other metals—Cooled 5-cc. portions of the solution obtained in the test for *carbonate* yield white precipitates with potassium ferrocyanide T.S. and with sodium sulfide T.S.

Lead—Add 2 Gm. of Zinc Oxide to 20 cc. of distilled water, stir well, add 5 cc. of glacial acetic acid, and warm upon a water bath until solution is effected: the addition of 5 drops of potassium chromate T.S. produces no turbidity or precipitate.

Assay—Digest about 1.5 Gm. of freshly ignited Zinc Oxide, accurately weighed, with 50 cc. of normal sulfuric acid until solution is complete. Then titrate the excess of sulfuric acid with normal sodium hydroxide, using methyl red T.S. as the indicator.

Each cc. of normal sulfuric acid is equivalent to 0.04069 Gm. of ZnO.

Storage—Preserve Zinc Oxide in well-closed containers.

U. S. P. Product of Zinc Oxide—Unguentum Zinci Oxidi.

ZINCI STEARAS

Zinc Stearate

Zinc. Stear.

Zinc Stearate is a compound of zinc with variable proportions of stearic acid and palmitic acid, corresponding to not less than 13 per cent and not more than 15.5 per cent of ZnO.

Description—Zinc Stearate occurs as a fine, white, bulky powder, free from grittiness, and has a faint, characteristic odor.

Solubility—Zinc Stearate is insoluble in water, in alcohol, and in ether.

Identification—Heat 1 Gm. of Zinc Stearate with a mixture of 25 cc. of distilled water and 5 cc. of hydrochloric acid: fatty acids are liberated, floating as an oily layer on the surface of the liquid, and the aqueous layer responds to the tests for zinc, page 593.

Reaction—Zinc Stearate is neutral to moistened litmus paper.

Alkalies or alkaline earths—Boil 2 Gm. of Zinc Stearate with 50 cc. of distilled water and 10 cc. of hydrochloric acid, filter while hot, and wash the separated acids with about 50 cc. of hot distilled water. Render the combined filtrate and washings alkaline with ammonia T.S., add ammonium sulfide T.S. to precipitate the zinc completely, dilute with distilled water to 200 cc., mix well, and filter. To 100 cc. of the clear filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 10 mg.

Fatty acid solidification temperature—Mix 25 Gm. of Zinc Stearate with 200 cc. of hot distilled water, then add 25 cc. of dilute sulfuric acid (made by adding 1 volume of sulfuric acid to 3 volumes of distilled water), and heat the mixture, with frequent stirring, until the fatty acids separate as a transparent layer. Wash the fatty acids with boiling distilled water until free from sulfate, collect them in a small beaker, and warm on a steam bath until the water has separated and the fatty acids are clear. Allow the acids to cool, melt, and filter them into a dry beaker while hot, and dry for 20 minutes at 100° C.: the solidification temperature of the fatty acids is not below 54° C., page 577.

Assay—Boil about 1 Gm. of Zinc Stearate, accurately weighed, with 50 cc. of tenth-normal sulfuric acid for 10 minutes, cool, and filter. Wash the filter and flask thoroughly with distilled water until the last washing is not acid to litmus paper, and titrate the excess of sulfuric acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 0.004069 Gm. of ZnO.

Storage—Preserve Zinc Stearate in well-closed containers.

ZINCI SULFAS

Zinc Sulfate

Zinc. Sulf.

 $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$

Mol. wt. 287.55

Zinc Sulfate contains not less than 55.58 per cent and not more than 61.0 per cent of ZnSO_4 , corresponding to not less than 99 per cent of the hydrated salt ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$).

Description—Zinc Sulfate occurs in colorless, transparent prisms, or small needles.

It may occur as a granular, crystalline powder. It is without odor and has an astringent, metallic taste. It is efflorescent in dry air.

Solubility—One Gm. of Zinc Sulfate dissolves in 0.6 cc. of water and in about 2.5 cc. of glycerin, at 25° C. It is insoluble in alcohol.

Identification—An aqueous solution of Zinc Sulfate responds to the tests for zinc, page 593, and for sulfate, page 592.

Reaction—An aqueous solution of Zinc Sulfate (1 in 10) is acid to litmus paper.

Free acid—An aqueous solution of Zinc Sulfate (1 in 20) is not colored pink by methyl orange T.S.

Alkalies or alkaline earths—Dissolve 2 Gm. of Zinc Sulfate in about 150 cc. of distilled water, contained in a 200-cc. volumetric flask. Precipitate the zinc completely by means of ammonium sulfide T.S., and add sufficient distilled water to make the mixture measure 200 cc. Mix well, and filter through a dry filter, rejecting the first portion of the filtrate. To 100 cc. of the subsequent filtrate, add a few drops of sulfuric acid, evaporate to dryness in a tared dish, and ignite. The weight of the residue does not exceed 5 mg.

Arsenic—An aqueous solution of Zinc Sulfate meets the requirements of the test for arsenic, page 554.

Heavy metals—Dissolve 0.5 Gm. of Zinc Sulfate in 5 cc. of distilled water, and transfer the solution to a Nessler tube. Add 10 cc. of a solution of potassium cyanide (1 in 10), mix well, and allow the mixture to become clear. Designate the tube containing this solution as "A." In a similar matched Nessler tube "B" place 5 cc. of distilled water, add exactly 0.5 cc. of standard lead solution, page 586, and 10 cc. of potassium cyanide solution (1 in 10). Add to the solution in each tube 0.1 cc. of sodium sulfide T.S. Mix the contents of each tube, and allow to stand for 5 minutes. Viewed downward over a white surface, the solution in "A" is no darker than that in "B," indicating not more than 10 parts per million of heavy metals.

Assay—Proceed as directed under *Zinci Acetas*, page 546, using about 1 Gm. of Zinc Sulfate. The weight of zinc oxide obtained, multiplied by 1.984, indicates its equivalent in ZnSO_4 .

Storage—Preserve Zinc Sulfate in well-closed containers.

ZINGIBER

Ginger

Zingib.

Ginger is the dried rhizome of *Zingiber officinale* Roscoe (Fam. *Zingiberaceæ*) known in commerce as Jamaica Ginger and African Ginger. The outer cortical layers are often either partially or completely removed.

Ginger contains not less than 4.5 per cent of ether-soluble extractive and not less than 12 per cent of cold-water extractive.

Description—

Unground Jamaica Ginger—Rhizome horizontal, laterally compressed, irregularly branched, from 4 to 16 cm. in length and from 4 to 20 mm. in thickness; the cork wholly removed; externally weak orange to weak yellowish orange, longitudinally striate, ends of branches with depressed stem-scars; fracture short, fibrous, starchy and resinous; internally yellowish brown to yellowish orange; odor agreeably aromatic; taste aromatic and pungent.

Unground African Ginger—Cork partly removed on the flattened sides, leaving light brownish areas; portions with cork longitudinally or reticulately wrinkled and grayish brown; internally light yellow to brown; taste aromatic and strongly pungent; otherwise resembling Jamaica Ginger.

Histology—Chiefly thin-walled, starch-bearing parenchyma cells, numerous scattered secretion cells and small vascular bundles, the latter very numerous and adjacent to the inner face of the narrow endodermis and separating the narrow cortex from the broad central cylinder; secretion cells mostly similar in size and shape to the parenchyma cells and with greenish yellow to orange oil or oleoresin or brown to reddish brown resin; vascular bundles closed collateral with few tracheæ, small phloem cells and usually accompanied by fibers lying on the inner face of or completely surrounding the vascular tissues; cork of several to many rows of cells in African Ginger.

Powdered Ginger—Weak yellowish orange (Jamaica Ginger), light yellowish brown to moderate yellow (African Ginger); starch grains numerous, from 5 to 40 microns in diameter, occasionally up to 60 microns in the long axis, nearly spherical, ovoid, ellipsoidal or pear-shaped, frequently with a characteristic beak, slightly lamellated, the hilum excentric and near the smaller end; fibers long, with rounded, pointed or notched ends, thin-walled, non-lignified or slightly lignified, with oblique pores and, where they join the parenchyma, distinctly undulate; long fiber-like cells with suberized walls and brown to dark brownish red, resin-like contents occasionally present; tracheæ spiral, reticulate or scalariform and frequently non-lignified; numerous greenish yellow to reddish brown secretion cells with oil or resin content; yellowish or brownish cork cells, thin-walled, occasionally in Jamaica Ginger and fairly numerous in African Ginger.

Assay for cold-water extractive—Place 4 Gm. of ground Ginger in a 200-cc. flask, fill to the mark with distilled water, and agitate at 30-minute intervals during 8 hours. Then allow the mixture to stand for 16 hours and filter it. Evaporate 50 cc. of the filtrate, representing 1 Gm. of the drug, on a water bath, dry the residue to constant weight at 100° C., and weigh it. The weight of the dry residue, representing cold-water extractive, is not less than 12 per cent of the weight of the Ginger taken for the test.

Assay for ether-soluble extractive—Place 20 Gm. of Ginger, in fine powder, and accurately weighed, in an extraction thimble of a Soxhlet or similar extractor, and extract with ether for 6 hours. Evaporate the ether extract on a steam bath until the odor of ether is no longer perceptible, then dry the residue in a desiccator over sulfuric acid for 18 hours: the weight of the extract so obtained is not less than 0.90 Gm.

U. S. P. Product of Ginger—Fluidextractum Zingiberis.

AVERAGE DOSE—Metric, 0.6 Gm.—Apothecaries, 10 grains.

GENERAL TESTS, PROCESSES AND APPARATUS

Absorbency of Purified Cotton

Absorbency Test for Purified Cotton—Take five 5-Gm. portions of purified cotton from five different parts of the package, pulling, not cutting, the samples. Prepare a test basket from copper wire approximately 0.4 mm. in diameter (No. 26 B. & S.) in the form of a cylinder approximately 5 cm. in diameter and 8 cm. deep, with spaces between the wires of approximately 2 cm., the basket weighing not more than 3 Gm.

Place 5 Gm. of the purified cotton in the basket, and hold the basket on its side approximately 12 mm. above the surface of distilled water at $25^{\circ}\text{C.} \pm 1^{\circ}$. Allow the basket to drop to the water and determine the time in seconds required for complete submersion, using a stop watch.

Remove the basket from the water and allow it to drain for 10 seconds in the same horizontal position, then place it immediately in a tared beaker, cover with a tared watch glass, and weigh, deducting the weight of the test basket and of the purified cotton to find the weight of water absorbed.

Alcohol Determination

General Process—Measure accurately not less than 25 cc. of the liquid in which the alcohol is to be determined, and note its temperature. Transfer it to a suitable distilling apparatus and, if its alcohol content is thought to be not more than 30 per cent, dilute it with an equal volume of distilled water, using the water to rinse the vessel that was used for measuring unless this vessel is a graduated pipette which has been standardized on the basis of the amount delivered. Distil, and collect a volume of distillate of about 2 cc. less than the volume of the original test liquid, adjust to the temperature at which the original test liquid was measured, add sufficient distilled water to measure exactly the original volume of the test liquid and mix thoroughly. Determine the specific gravity of the liquid at 25°C. and from this result ascertain the percentage, by volume, of alcohol contained therein, see *Alcoholometric Table*, page 793. The proportion of alcohol by volume in the distillate equals that in the liquid examined.

If the liquid under examination contains more than 30 per cent of alcohol, proceed as directed above, except: dilute the sample with about twice its volume of distilled water and collect a volume of distillate about 2 cc. less than twice the volume of the original test liquid, cool or bring to the temperature at which the original liquid was measured, add sufficient distilled water to measure exactly twice the original volume of the test liquid and determine its specific gravity. The proportion of alcohol by volume in this distillate, as ascertained from its specific gravity, equals one-half that in the liquid examined.

The distillate must be clear or only slightly cloudy, must not contain any non-volatile material and not more than traces of volatile substances other than alcohol and water.

This general method is suitable for examining most fluidextracts and tinctures, provided the capacity of the distilling flask is sufficient (commonly two to four times the volume of the liquid to be distilled) and the rate of distillation is such that clear distillates are produced. Some alcoholic preparations will, however, require special treatment or the observance of special precautions to yield suitable distillates. All distillates must be clear or nearly so. If cloudy, they may be clarified by agitation with purified talc, or with precipitated calcium carbonate, and filtered, after which the temperature of the filtrate is adjusted and the alcohol determined by specific gravity. All of this should be done under conditions that will minimize the loss of alcohol by evaporation.

Frothing—Liquids which froth to a troublesome extent during distillation may be distilled by strongly acidulating them with phosphoric or sulfuric acid, or by the addition of a slight excess of calcium chloride solution, or by the addition of a little paraffin or yellow wax to the distilling flask.

Bumping—Liquids that tend to bump badly when heated (particularly resinous solutions) may be distilled by making them alkaline with magnesia magma or by placing pieces of pumice, glass beads, or similar materials in the distilling flask with the liquid, or by similar means of distributing the heat.

Glycerin—Liquids that contain glycerin must be diluted with sufficient distilled water so that the residue, after distillation, will contain at least 50 per cent of water.

Iodine—All solutions of iodine must be deprived of free iodine, before being distilled, by treatment with powdered zinc, or by the addition of just sufficient solution of sodium thiosulfate followed by a few drops of sodium hydroxide T.S. to fix volatile sulfur compounds.

Volatile Substances—Spirits, elixirs, tinctures, etc., that contain appreciable proportions of volatile materials other than alcohol and water, such as volatile oils, chloroform, ether, camphor, etc., are treated as follows: Mix the accurately measured liquid with about an equal volume of saturated solution of sodium chloride in a separator, then add a volume of purified benzin equal to the sample, and shake the mixture to extract the interfering volatile ingredients. Draw off the separated lower layer, and extract the benzin solution with two successive portions of a saturated solution of sodium chloride, using about one-half as much each time as was used in the first extraction mixture. Combine the aqueous saline solutions, and distil the mixture in the usual way, collecting a volume of distillate having a simple ratio to the volume of the original liquid.

If a troublesome emulsion develops in the liquid mixture when shaken with the benzin, dilute a fresh portion of the original liquid with water and distil it as directed in the general process. Then treat this distillate as directed above, using purified benzin and sodium chloride solution, and distil the aqueous saline solution so produced to obtain a distillate which is free from volatile substances other than alcohol and water.

In preparing *collodion* for distillation, use water in place of the saturated solution of sodium chloride directed above.

If volatile oils are present in small proportions only, and a cloudy distillate is obtained, the benzin treatment not having been employed, the distillate may be clarified and rendered suitable for the specific gravity determination by shaking it with about one-fifth its volume of purified benzin, or by filtering it through a thin layer of purified talc.

Other Preparations Requiring Special Treatment—Preparations containing free ammonia, as *aromatic spirit of ammonia*, must be rendered slightly acid with sulfuric acid before being distilled.

Spirit of glyceryl trinitrate must be treated with a small excess of sodium hydroxide before being distilled.

Chloroform liniment, *camphor and soap liniment*, and *liniment of soft soap* are treated with an excess of sulfuric acid to effect decomposition of the soap before they are extracted with purified benzin as directed in the general process.

Alkali Salts of Organic Acids

Unless otherwise directed, heat about 2 Gm. of the salt, accurately weighed, in a platinum or porcelain crucible (*Caution*—Do not use platinum crucibles for lithium salts), heating at first very gently, then gradually raising the temperature until the salt is thoroughly carbonized. The final temperature must not exceed a dull red heat and the flame of the burner must not come in contact with the carbonized mass. After allowing the carbonized mass to cool, disintegrate it with the aid of a stout glass rod, and transfer the mass and crucible to a beaker. Add 50 cc. of distilled water and exactly 50 cc. of half-normal sulfuric acid, cover the beaker with a watch glass, and boil the contents for 30 minutes. Then filter the solution, and wash the residue with hot distilled water until the washings cease to redden blue litmus paper. Now determine the residual acid in the cooled filtrate by titration with half-normal sodium hydroxide, using methyl orange T.S. as the indicator. The volume of half-normal sulfuric acid consumed, multiplied by the proper equivalent of the salt, represents the quantity of the salt present in the quantity taken.

Anti-Anemia Preparations

Liver, stomach, and other preparations used for this purpose to be recognized as meeting the specifications of this Pharmacopeia, must be approved by the "U. S. P. Anti-Anemia Preparations Advisory Board." Approved products must have complied with the following specifications:

1. There shall have been submitted, from time to time, as requested by the Board, satisfactory clinical data from treatment with the product in question, of cases of Addisonian pernicious anemia.

2. The clinical data submitted shall satisfy the Board that the daily (oral or intramuscular) administration of a given uniform amount of the material in question has produced, under adequately controlled conditions, a satisfactory clinical and hematopoietic response in pernicious anemia.

3. The Board may, at its discretion, define the amount of such material given daily as 1 U. S. P. Unit, and as oral or injectable, according to the nature of the material.

4. The potency of preparations as defined by the Board shall be stated on the label or in the package literature as follows:

[. . . (no.) (Gm. or cc.) (capsules, teaspoon, etc.) of material prepared by the

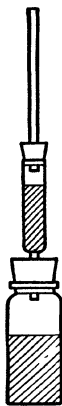
method employed in producing the contents of this (bottle, vial, package) constitutes a U. S. P. Unit.]

5. The average dose shall be stated on the label or in the package literature and shall not be less than would result in the patient's receiving 1 U. S. P. Unit daily.

Arsenic Test

Reagents satisfactory for use in the arsenic test and in the preparation of the chemical for the test produce either no stain in a blank test or a stain which is scarcely perceptible.

Test Apparatus—Prepare several generators as follows (see the illustration): Select a generator bottle of about 50-cc. capacity having a mouth about 2.5 cm. in diameter, and provide a well-fitting rubber stopper suitably perforated. Through the perforation insert a vertical exit tube about 12 cm. in total length and 1 cm. in diameter along the entire upper portion (for about 8 cm.) and constricted at its lower extremity to a tube of about 4 cm. in length and about 5 mm. in diameter. The smaller portion of the tube should extend but slightly below the stopper. Place in the tube a pledget of purified cotton, 5 cm. in length and extending downward from a point 3 cm. below the top of the tube. Moisten the pledgets of cotton in the several generator exit tubes uniformly with a mixture of equal volumes of lead acetate T.S. and distilled water. To remove the excess of lead acetate solution from the cotton and adhering droplets from the walls of the tube apply gentle suction to the constricted end of the tube. In the upper end of this tube, insert through a tightly-fitting, perforated rubber stopper a glass tube 12 cm. in length and having an internal diameter of from 2.5 to 3 mm. Place a strip of mercuric bromide test paper (page 738) in this tube, bending the upper end of the strip so that it will retain its position. This strip should extend to within about 2 cm. of the perforated rubber stopper and must not be placed in the tube until the test is to be made. This tube must be thoroughly cleaned and dried each time it is used.



Arsenic Test
Apparatus

Standard Arsenic Test Solution—Dissolve 0.1 Gm. of arsenic trioxide which has been finely pulverized, dried over sulfuric acid and accurately weighed, in about 5 cc. of a 20 per cent solution of sodium hydroxide. Neutralize the solution with diluted sulfuric acid, and add 10 cc. more of diluted sulfuric acid and sufficient recently boiled distilled water to bring the volume of the solution to exactly 1000 cc. at 25° C. Accurately measure 10 cc. of this solution, transfer it to a 1000-cc. flask, and add 10 cc. of diluted sulfuric acid and sufficient recently boiled distilled water to make exactly 1000 cc. of solution at 25° C. Use this solution, which contains 0.001 milligram of arsenic trioxide in each cc. (at 25° C.) in preparing the standard stain. Keep this solution in a glass-stoppered bottle. It is advisable to make fresh solutions when new standard stains are to be prepared.

Preparation of the Chemical to be Tested—Add 1 cc. of sulfuric acid to 5 cc. of an aqueous solution of the chemical substance (1 in 25), unless another quantity is directed in the monograph. This acidulation is not necessary in the case of inorganic

acids. Now, unless especially directed otherwise, add 10 cc. of sulfurous acid. Evaporate the liquid in a small beaker, on a water bath, until it is free from sulfurous acid and has been reduced to about 2 cc. in volume. Dilute this evaporated liquid to 5 cc. with distilled water. Substances subjected to special treatments directed in the monographs need not be further prepared for testing.

THE TEST

Preparation of the Standard Stain—Place in the generator bottle 5 cc. of potassium iodide T.S., 2 cc. (accurately measured at 25° C.) of the standard arsenic T.S., 5 cc. of stannous chloride T.S., acid, and 28 cc. of distilled water. Now add 1.5 Gm. of granulated reagent zinc (in No. 20 powder), and immediately insert the stopper containing the exit tubes prepared according to the description under *Test Apparatus*. Keep the generator bottle immersed in water at 25° C. during the period of the test. If the reaction is too violent, the stain will not take the form of a distinctive band, and the comparison of color intensity will be difficult. After the test has continued for 1 hour, remove the mercuric bromide test paper and place it in a clean, dry tube for comparison. This stain represents 0.002 milligram of arsenic trioxide. Since light, heat and moisture cause the stain to fade rapidly, comparison should be made as soon as possible. The stained test papers may be preserved by dipping in hot, melted paraffin or by keeping them over phosphorus pentoxide, protected from light.

Testing the Chemical—Place in the generator bottle 5 cc. of potassium iodide T.S., 5 cc. of the solution to be tested for arsenic, and add 5 cc. of acid stannous chloride T.S. Set the apparatus aside at room temperature for a period of 10 minutes then add 25 cc. of distilled water and 1.5 Gm. of granulated reagent zinc (in a No. 20 powder), and immediately insert the stopper with exit tubes, as previously described under *Preparation of the Standard Stain*. Keep the generator bottle immersed in water at 25° C. during the period of the test. When the evolution of hydrogen has proceeded actively for 1 hour, remove the mercuric bromide test paper, and carefully compare the stain upon it with the standard stain prepared as previously described. The stain produced by the chemicals tested does not exceed in length or intensity of color that prepared as the standard, indicating not more than 1 part of arsenic trioxide in 100,000 parts of the substance being tested.

Interfering Chemicals—Antimony, if present in the substance being tested, will produce a gray stain. *Sulfites, sulfides, thiosulfates*, and other compounds which liberate hydrogen sulfide or sulfurous acid when treated with sulfuric acid, must be oxidized by means of nitric acid and then reduced by means of sulfurous acid as directed under *Preparation of the Chemical to be Tested* before they are placed into the apparatus. Certain *sulfur compounds* as well as *hydrogen phosphide* give a bright yellow band on the test paper. If sulfur compounds are present, a darkening of the absorbent cotton previously moistened with lead acetate T.S., will occur. If such is the case, the operation as directed under *Preparation of the Chemical to be Tested* must be repeated upon a fresh portion of the solution being tested, and greater care must be used in effecting the complete removal of the sulfurous acid. In testing hypophosphites special care should be observed to oxidize completely the solution being tested as directed, otherwise the evolution of hydrogen phosphide may result in a yellow stain which might be confused with the orange yellow color produced by arsine. The stain produced by hydrogen phosphide is differentiated

from that given by arsine by moistening it with ammonia T.S. A stain caused by arsine will become dark when so treated, but a stain produced by hydrogen phosphide will not materially change in color. The test apparatus must be thoroughly cleaned and dried immediately before and after use.

Ash or Non-Volatile Matter in Chemicals

Weigh accurately from 1 to 2 Gm., or the amount of the chemical directed in the text, in a tared crucible of platinum, porcelain, or other suitable material. Ignite until thoroughly charred, cool, moisten the residue with 1 cc. of sulfuric acid, then cautiously ignite until the carbon is completely consumed. Conduct the ignition in a place protected from air currents, and use as low a temperature as possible to effect the combustion of the carbon. When the carbon has completely disappeared, cool the crucible in a desiccator, and weigh.

To test for non-volatile matter in volatile inorganic chemicals, proceed as directed in the preceding paragraph, using the lowest effective temperature.

Bacteriological Examination of Gelatin

Preparation of Sample—Employ aseptic conditions throughout.

Use preferably a powdered sample. If the gelatin is in sheets, flakes, or shreds, grind the latter under aseptic conditions through a sterile grinder into a sterile bag or other sterile container. After mixing thoroughly, weigh 5 Gm. of the powdered sample, and place it in a sterile dilution bottle containing 95 cc. of sterile distilled water. After the gelatin is thoroughly wetted, place the container in a water bath, heated to between 40° and 45° C. When the contents become uniformly heated, shake well until solution is complete.

Dilutions—Dilute 20 cc. of this freshly prepared (1 in 20) solution with 80 cc. of sterile distilled water to make a 1 in 100 solution. By decimal dilution prepare 1 in 1000 and 1 in 10,000 dilutions of the dissolved gelatin. If the gelatin is known to be of good quality, the 1 in 20 and 1 in 100 dilutions will suffice. The additional weaker solutions are to be made for gelatin samples known or thought to possess a high bacterial content. Shake each dilution vigorously at least twenty-five times before a second dilution is made from it or before a sample is removed for plating.

Plating for Total Count—Use sterile pipettes graduated to deliver 1 cc., and glass-covered Petri dishes 10 cm. in diameter and 15 mm. in depth for plating.

Plate out in duplicate 1 cc. each of the 1 in 20, 1 in 100, and other dilutions if necessary. Plating should be done immediately after the dilutions are prepared. Place 1 cc. of the dilution in a sterile Petri dish, add to the Petri dish 10 cc. of liquefied nutrient agar at a temperature of 40° C. Raise the cover of the Petri dish just enough for the introduction of the pipette or culture medium. Flame the lips of all flasks, test tubes, and other containers used in delivering the medium. Mix the contents of the Petri dish thoroughly by tilting and rotating the dish. All plates are to be solidified as quickly as possible and, after inverting all glass-covered plates, incubate them for 72 hours at 37° C. Count by preference the plates having between 30 and 300 colonies. Enumerate and express results in terms of bacteria per Gm. of gelatin. Counting is to be done with a lens of 2.5 diameter magnification, with a focal distance of 3.5 inches.

Presence of *Escherichia coli*—Inoculate fermentation tubes containing litmus lactose bouillon in duplicate or triplicate with 1-cc. portions of the 1 in 100 freshly prepared dilution, and incubate at 37° C. for 48 hours. Examine each tube at the end of 24 and 48 hours. If gas is produced in one or more of the fermentation tubes, make streak cultures therefrom as soon as possible after gas formation occurs, on Endo's medium or on eosin-methylene blue agar, and incubate these at 37° C. for 24 hours. Typical colonies are positive evidence of the presence of *E. coli* in a 1 in 100 dilution of the gelatin under examination. Transfer organisms from at least two of these typical colonies each to an agar slant and a fermentation tube containing litmus lactose bouillon. If typical colonies have not developed within 24 hours on Endo's medium or eosin-methylene blue agar, incubate the inoculated plates for another 24 hours, after which at least two of the colonies considered most likely to be species of the *coli-aerogenes* group are transferred each to an agar slant and fermentation tube containing litmus lactose bouillon. Incubate the agar slants at 37° C. for 24 hours and examine the growth microscopically after staining by Gram's method. Incubate the inoculated fermentation tubes at 37° C. until gas production is noted, but the incubation period is not to exceed 48 hours. Report *E. coli* as absent in the 1 in 100 dilution of gelatin inoculated in the original fermentation tubes if gas is not produced after 48 hours of incubation at 37° C. If gas is produced, *E. coli* is reported as being present if the confirmatory evidence is positive and *E. coli* is reported as being absent if the confirmatory tests are negative. Positive confirmatory evidence is the formation of gas in litmus lactose bouillon from colonies on Endo's medium or on eosin-methylene blue agar and the demonstration of Gram-negative, non-spore forming bacilli in the agar cultures.

Culture Media

Endo's Medium—

Lactose.....	10	Gm.
Dibasic Potassium Phosphate.....	3.5	Gm.
Sodium Carbonate, anhydrous.....	1	Gm.
Basic Fuchsin (90 per cent dye content).....	0.5	Gm.
Sodium Bisulfite.....	2.5	Gm.
Alcohol.....	5	cc.
Distilled Water.....	35	cc.
Nutrient Agar (need not have been sterilized, but if not sterile must be freshly prepared).....	960	cc.

Dissolve the lactose and the dibasic potassium phosphate in the hot liquefied nutrient agar, the sodium carbonate in 10 cc. of distilled water, the basic fuchsin in the alcohol, and the sodium bisulfite in 25 cc. of distilled water. Add the sodium carbonate solution, the fuchsin solution, and the sodium bisulfite solution to the nutrient agar solution, mixing well after each addition. Place in suitable containers, and sterilize by Process D, page 617, or by any other adequate and suitable method.

Endo's Medium has a red or pink color when hot, which becomes a faint flesh color or disappears upon cooling. It has a hydrogen-ion concentration equivalent to a pH of 7.6 to 8.0. It is preferable to prepare Endo's Medium freshly as needed as it deteriorates upon standing, especially if exposed to light.

Eosin-methylene-blue Agar—

Peptone.....	10 Gm.
Dibasic Potassium Phosphate.....	2 Gm.
Agar, finely shredded.....	15 Gm.
Lactose in sterile 20 per cent aqueous solution.....	50 cc.
Eosin Y (85 per cent dye content) in 0.2 per cent aqueous solution.....	20 cc.
Methylene Blue (90 per cent dye content) in 0.5 per cent aqueous solution.....	20 cc.
Distilled Water.....	1000 cc.

Dissolve the peptone, dibasic potassium phosphate, and agar in the distilled water by heating in an autoclave for 15 minutes at 15 pounds pressure or by boiling in a water bath. Replace any of the water lost by heating. Adjustment of the pH and filtration of the medium are not required. Place 100-cc. quantities in flasks and sterilize by heating in an autoclave for 15 minutes at 15 pounds pressure (121.5° C.).

Just prior to use liquefy the medium by means of heat and to each flask containing 100 cc. add 5 cc. of the lactose solution, 2 cc. of the eosin Y solution, 2 cc. of the methylene blue solution, and mix well.

Litmus Lactose Bouillon—

Extract of Beef.....	3 Gm.
Peptone.....	10 Gm.
Lactose.....	10 Gm.
Distilled Water, a sufficient quantity, to make.....	1000 cc.
Litmus Test Solution, a sufficient quantity.	

Dissolve the extract of beef, the peptone, the sodium chloride, and the lactose in 975 cc. of distilled water by the aid of heat; add sufficient normal sodium hydroxide to bring the hydrogen-ion concentration to pH 7.4, or to 0.2 higher than the pH desired in the finished broth, and filter. Add sufficient litmus test solution to give a faint blue tint. Add sufficient distilled water through the filter to make 1000 cc. Sterilize by Process D, page 617.

Sodium Chloride, 5 Gm. per 1000 cc., may be added to this medium, if preferred.

Litmus Test Solution—

Litmus, powdered.....	25 Gm.
Alcohol.....	
Distilled Water, each, a sufficient quantity.	

Extract the litmus with three successive portions of 100 cc. each of boiling alcohol, continuing each extraction for about one hour. Filter, wash with alcohol, and discard the alcoholic solutions. Digest the residue with about 25 cc. of cold distilled water, filter, and discard the filtrate. Finally extract the residue with 125 cc. of boiling distilled water, cool and filter.

Litmus turns red with acids and blue with alkalies. The pH range is from 4.5 to 8.3. Preserve litmus T.S. in wide-mouthed containers, stoppered with loose plugs of purified cotton.

Nutrient Agar—

Agar, finely shredded.....	15 Gm.
Peptone.....	5 Gm.
Extract of Beef.....	3 Gm.
Distilled Water.....	1000 cc.
Normal Sodium Hydroxide, a sufficient quantity.	

Dissolve the agar in 800 cc. of distilled water by means of heat. Dissolve the peptone and extract of beef in 200 cc. of distilled water. Mix the two solutions. Add sufficient normal sodium hydroxide to bring the hydrogen-ion concentration to pH 7.2, or to 0.2 higher than the pH desired in the finished medium. If clarification is desired, filter the medium while hot through cotton enclosed in gauze into suitable containers. Sterilize by Process C, page 616, for 20 minutes at 15 pounds pressure (121.5° C.).

Sodium Chloride, 5 Gm. per 1000 cc., may be added to this medium, if preferred.

Boiling or Distilling Temperatures

To determine the temperatures between which an official liquid may boil or the percentage of the material which distills between specified temperatures, use Method I or Method II as directed in the text. The minimum boiling point is the temperature shown by the thermometer when the first 5 drops of the liquid have been collected from the condenser. The maximum boiling point is the temperature at which the last liquid evaporates from the bottom of the flask or when the proportion specified in the text has been collected.

Method I

This method is to be used with liquids for which the permissible range in boiling temperature is 5° C. or less.

Apparatus Required—A distilling bulb of from 50- to 60-cc. capacity to the lower part of the neck; the length of the neck is from 10 to 12 cm. and its internal diameter from 14 to 16 mm. The outlet tube, of from 10 to 12 cm. in length and from 4 to 5 mm. internal diameter, is to be attached to the neck at approximately its midpoint, forming an angle from 70° to 75° with the lower portion of the neck.

A straight glass condenser with a water jacket from 40 to 60 cm. in length; the distance from the upper end of the water jacket to the neck of the bulb being from 18 to 25 cm.

Thermometer—In order to avoid the necessity for an emergent stem correction, it is advisable that an accurately standardized thermometer of the Anschütz type be used. If such a thermometer is not available, a thermometer of Type I or Type II, page 622, may be employed, applying the emergent stem correction as described under *Melting Points* (page 595), the length of the emergent stem being expressed as the number of degrees represented on the stem between the lower end of the stopper and the graduation for the highest boiling temperature. When placed in position, the top of the bulb of the thermometer is level with the center of the opening of the outlet tube.

Provide an asbestos board 12 to 15 cm. square and 3 to 5 mm. thick, having a circular perforation, located centrally, for the reception of the bulb. The edge of the asbestos around the perforation should fit closely to the bulb when the latter is set into it. The size of the perforation should be such that when the bulb is set into it the portion of the bulb below the upper surface of the asbestos will have a capacity of from 3 to 4 cc.

Procedure—Place the asbestos board on a tripod or other suitable support. Place in the distilling bulb 25 cc. of the liquid to be tested, insert the thermometer, stand the bulb in an upright position in the perforation of the asbestos board, and connect it with the condenser. Then distil the liquid by the application of heat, from a suitable source, at the rate of 1 cc. for each 15 to 20 seconds, noting the temperature as soon as 5 drops of the liquid have distilled into the receiver, and when the last liquid evaporates from the bottom of the flask or when the specified percentage has distilled over. Correct the observed temperature readings for any variation in the barometric pressure from the normal (760 mm.) by allowing 0.1 degree for each 2.7 mm. of variation, adding if the pressure is lower, or subtracting if higher than 760 mm.

NOTE—In order to have the entire volatile portion distil over at the prescribed rate, it is best to make a preliminary distillation of a separate portion of 25 cc. of the liquid, during which the source of heat is regulated so that the distillation proceeds at the prescribed rate. Having thus regulated the heat, temporarily remove it. Then clean the bulb, recharge it with a fresh portion of 25 cc. of the liquid, and conduct a new distillation as described above.

Method II

This method is to be used with liquids for which the permissible range in boiling temperature exceeds 5° C.

Apparatus Required—A 200-cc. distilling bulb with an outlet tube attached about midway of the neck and making an angle of from 70° to 75° with the lower portion of the neck. The length of the neck is from 10 to 12 cm. and its inside diameter is from 18 to 24 mm. The length of the outlet tube is from 10 to 12 cm. and its inside diameter is from 5 to 6 mm.

Use a straight glass condenser, a thermometer, and an asbestos board as in *Method I*. The diameter of the perforation in the asbestos board is 50 mm.

Procedure—Place the distilling bulb in an upright position in the perforation in the asbestos board and connect it with the condenser. The outlet tube is to extend from 25 to 35 mm. into the condenser beyond the connecting stopper.

Measure 100 cc. of the liquid* to be tested, using a cylinder having 1-cc. graduations. Note the temperature of the liquid, and transfer it as completely as possible to the distilling bulb. Use this cylinder as the receiver for the distillate without

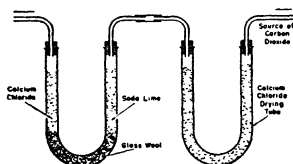
* For the determination of the distillation range of the cresol from *saponated solution of cresol*, use the volume of the cresol obtained in the test and the distilling bulb prescribed in *Method I*.

rinsing out any of the adhering liquid. Insert the thermometer, connect the distilling bulb with the condenser as described in *Method I*, and distil by the application of heat, from a suitable source, at the rate of from 4 to 5 cc. per minute, collecting the distillate coming over between the temperatures specified in the text. Bring the distillate to the same temperature as that at which the liquid was originally measured, and note its volume. Correct the temperature reading for barometric pressure, and apply the emergent stem correction as described under *Melting Points* (page 595).

Liquids which begin to distil below 80° C. are cooled to from 10° to 15° C. before measuring the 100 cc. for the test. The end of the condensing tube is fitted with an adapter bent at a suitable angle and the end of the adapter is passed through a cork inserted into the receiving cylinder. The cork has a small perforation to permit the exit of air. The receiving cylinder is kept immersed in ice to within 2.5 cm. of its height during the distillation.

Carbon Dioxide Absorbency of Soda Lime

Fill the lower transverse section of a U-shaped drying tube of 16 mm. internal diameter and 15 cm. height with loosely packed glass wool. Place in one arm of the tube approximately 5 Gm. of anhydrous calcium chloride, and accurately weigh the tube and contents. Into the other arm of the tube place from 9.5 to 10.5 Gm. of soda lime, and again weigh accurately. Stopper the open arms of the U-tube, and connect the side tube nearer the soda lime with a suitable source of supply of carbon dioxide. Connect the other side tube to a protective calcium chloride drying tube. Pass carbon dioxide through the U-tube at a rate of 75 cc. per minute for exactly 20 minutes. Disconnect the U-tube, cool to room temperature, remove the stoppers, and weigh: the increase in weight is not less than 22 per cent of the weight of the soda lime used for the test.



Soda Lime Absorbency Test Apparatus

Carbon Monoxide-Free Air, Carbon Dioxide and Nitrogen

The carbon monoxide test for the medicinal gases frequently requires carbon monoxide-free gas which is treated in the same manner as the gas being tested and therefore serves as a standard by which the final colorimetric estimation is accomplished.

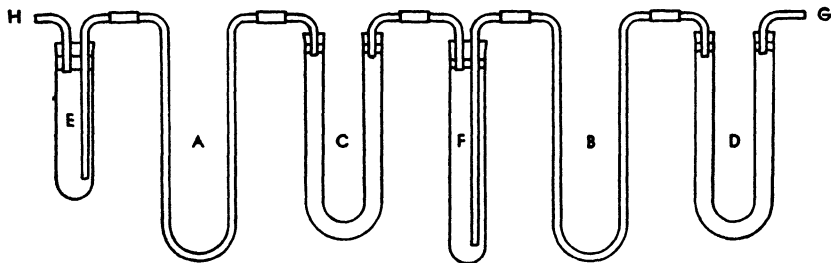
The apparatus required for the preparation of carbon monoxide-free gases is shown in the illustration. The U-tubes *A* and *B* are made from glass tubing of

approximately 5 mm. internal diameter and each tube, which is immersed in a suitable oil bath with heating device, is filled with iodine pentoxide so as to give a column of approximately 20 cm. in total length. The U-tubes *C* and *D* are drying tubes of conventional type and are filled with anhydrous calcium chloride. The tubes *E* and *F* are wide mouth test tubes.

Place in tube *F* 25 cc. of potassium iodide T.S. and in tube *E* 5 cc. of potassium iodide T.S., 5 cc. of distilled water and 3 drops of starch T.S. These tubes are equipped with two-holed stoppers and are connected to the system with suitable glass tubing as shown in the diagram.

Heat the oil bath at tube *A* to about 215° C. and that at tube *B* to about 150° C. and admit at *G* the gas to be rendered carbon monoxide-free. Pass the gas through the system for approximately 3 hours at a rate corresponding to about 30 bubbles per minute at tube *E*. Lower the temperature of the oil bath at tube *A* to about 150° C., replace the indicator solution in tube *E* with a fresh charge and pass 10 liters of gas through the system at the rate of approximately 200 cc. per minute.

If the solution in tube *E* becomes colored blue or purple, raise the temperature of the oil bath at *A* to 215° C. and proceed as before. When no coloration appears in the solution of tube *E* at the end of this procedure the sample of carbon monoxide-free gas is collected at *H*.



Apparatus for Carbon Monoxide-Free Gases

Carbon Monoxide in Oxygen

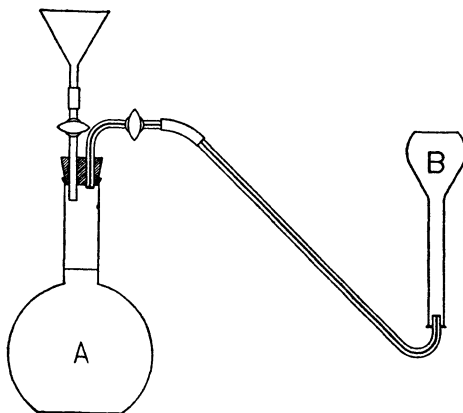
Equip a 1000-cc. flask (*A*), having a long neck, with a tightly-fitting, two-hole rubber stopper. Insert a straight stopcock through one hole. Into the other hole place a capillary stopcock one arm of which is bent at a right angle, as illustrated. The end of the capillary should reach to within 1 to 2 mm. of the lower surface of the stopper. The stopcocks must be capable of holding a vacuum. Determine the capacity of the flask with the stopper inserted. Indicate with a suitable marking a 50-cc. volume on the neck of the flask.

Fill flask *A* completely with distilled water, and invert it into a pneumatic trough. Admit the gas to be tested by displacement until the water level reaches the mark previously made on the flask, thus permitting 50 cc. of water to remain in the flask. Displace the remainder of the water with nitrogen (carbon monoxide-

free), then tightly close the flask. Having placed the flask in the upright position, attach a funnel by means of rubber tubing to the straight stopcock tube.

Through the funnel pass 290 cc. of freshly prepared alkaline sodium hydrosulfite T.S., avoiding the introduction of air bubbles. When the total quantity of the test solution has been added, agitate the flask for 5 minutes, and then allow distilled water to be drawn into the flask through the funnel until the normal atmospheric pressure is restored within the flask.

By means of rubber tubing connect a suitable glass capillary delivery tube, previously filled with distilled water, to the capillary stopcock. Fill a 100-cc. volumetric flask (B) with distilled water, and invert it in a pneumatic trough. Place the free end of the delivery tube under the mouth of the volumetric flask. Displace the remaining gas in flask A by distilled water, forcing the gas into the inverted flask B. The volume of gas collected does not exceed 90 cc. Displace the remaining distilled water in the flask by nitrogen (carbon monoxide-free) and insert the stopper.



Carbon Monoxide Test Apparatus

Add 10 cc. of distilled water to 0.5 cc. of blood, page 660, and mix thoroughly. Immediately add 2.5 cc. of the blood dilution to flask B, stopper, and shake the flask frequently during 15 minutes. Add to the flask 40 mg. of a mixture of equal parts by weight of pyrogallol and tannic acid. Shake thoroughly, and allow the flask to stand in the dark for 15 minutes. Pour the contents of the flask into a test tube for observation. The solution from the Oxygen being tested shows no pink coloration.

Carbonizable Substances

In tests for carbonizable substances, unless otherwise directed, add the specified quantity of the substance, finely powdered if in solid form, in small portions to the comparison container, which is made of colorless glass resistant to the action of sulfuric acid, and containing the specified volume of sulfuric acid, which contains not less than 94.5 per cent and not more than 95.5 per cent H_2SO_4 , determined by titration. Agitate the container or stir the mixture with a glass rod until solution is complete, allow the solution to remain at rest for 15 minutes, and compare the color of the solution with that of the specified matching fluid in a comparison container which is also of colorless glass and has the same internal dimensions and cross-section, viewing the fluids transversely against a background of white porcelain or white glass.

When heat is directed in order to effect solution of the substance in the sulfuric acid, the sample and the acid are to be mixed in a test tube and heated as directed, and the solution then transferred to the comparison container for matching.

Preparation of the Matching Fluids—Accurately measure the prescribed volume of the colorimetric test solutions (see *Colorimetric Solutions*, page 743) and distilled water with either burettes or pipettes, having graduations in 0.1 cc. or less, into one of the matching containers, and thoroughly mix the solutions in the container. For purposes of comparison the formulas are given below for a series of twenty matching fluids, each designated by a letter of the alphabet. These are also purely for informational purposes and are classified into five groups of colors. The Matching Fluids should be freshly prepared each day as required.

Matching Fluids	Parts of Cobaltous Chloride C.S.	Parts of Ferric Chloride C.S.	Parts of Cupric Sulfate C.S.	Parts of Distilled Water
A	0.1	0.4	0.1	4.4
B	0.3	0.9	0.3	8.5
C	0.1	0.6	0.1	4.2
D	0.3	0.6	0.4	3.7
E	0.4	1.2	0.3	3.1
F	0.3	1.2	0.0	3.5
G	0.5	1.2	0.2	3.1
H	0.2	1.5	0.0	3.3
I	0.4	2.2	0.1	2.3
J	0.4	3.5	0.1	1.0
K	0.5	4.5	0.0	0.0
L	0.8	3.8	0.1	0.3
M	0.1	2.0	0.1	2.8
N	0.0	4.9	0.1	0.0
O	0.1	4.8	0.1	0.0
P	0.2	0.4	0.1	4.3
Q	0.2	0.3	0.1	4.4
R	0.3	0.4	0.2	4.1
S	0.2	0.1	0.0	4.7
T	0.5	0.5	0.4	3.6

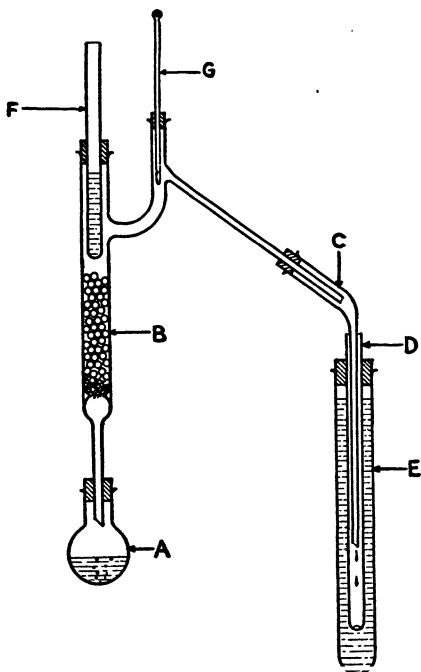
Chloroform Determination

This method may be used for the determination of chloroform in mixtures with alcohol or with alcohol and water. The apparatus required consists of a 100-cc. extraction flask, *A*, a dephlegmator, *B*, an adapter, *C*, a carbon tube, *D* (Eggertz Color Comparison Tube) having a capacity of 30 cc. and graduated to 0.1 cc., and a water jacket, *E*, for the carbon tube. The dephlegmator consists of a glass tube of 1 inch internal diameter and 11 inches in length which is sealed at one end to a glass tube of $\frac{1}{4}$ inch internal diameter and 4 inches in length, the end of which is ground to an angle of 45° . At a distance of 1 inch above the joint the larger tube is indented at four points equally spaced about its circumference, the indentations nearly meeting in the center of the tube. The top of the tube is finished with a ring. A side tube of $\frac{1}{2}$ inch internal diameter is sealed to the larger tube at a point $3\frac{1}{2}$ inches below the top, and this tube is bent vertically upwards with a smooth curve so that the distance between the opposing walls of the tubes is 2 inches and the top of the side tube 2 inches above the top of the larger tube. A delivery tube

of $\frac{1}{4}$ inch internal diameter and 9 inches in length is sealed to the side tube about midway of its length, the delivery tube forming an angle of about 120° to the upward extension of the side tube. The top of the main tube is closed with a 1-hole cork stopper, the surface of which has been lightly charred, which carries a glass refluxing tube, *F*, of $\frac{1}{2}$ inch internal diameter and 10 inches in length, sealed at the lower end, and extending to about $\frac{1}{2}$ inch below the entrance to the side tube, the refluxing tube being filled to about one-half its length with alcohol. A pledget of glass wool is placed upon the indentations in the main tube and the tube then filled to a height of about 5 inches with glass beads. The open end of the side tube is closed with a lightly charred cork carrying a thermometer, *G*, graduated to 100° C. The delivery tube is attached by a lightly charred cork to a bent adapter, the extension of which is bent vertically downwards and extends about two-thirds of the distance to the bottom of the carbon tube. The carbon tube is supported by means of a one-hole stopper in a test tube of about $1\frac{1}{2}$ inch internal diameter and 12 inches in length, which is to be filled with a mixture of finely crushed ice and water during the distillation.

Place 20 cc. of chloroform liniment in the flask, add 10 cc. of alcohol and 20 cc. of distilled water, and connect the flask to the dephlegmator by a one-hole cork stopper, the surface of which has been lightly charred after boring. Fill the refluxing tube to about one-half its depth with alcohol. Place 5 cc. of distilled water in the carbon tube, connect the dephlegmator with an adapter which extends to within about 1 inch of the water in the carbon tube, and surround the carbon tube with a mixture of ice and water. The carbon tube should be lowered as necessary during the distillation to keep the end of the adapter above the liquid in the carbon tube.

Heat the liquid in the flask until it boils gently, and continue the heating until no more chloroform is seen to sink through the water in the carbon tube and the interior walls of the dephlegmator and adapter are free from globules. The temperature recorded by the thermometer should not rise above 78° C. during the distillation. When distillation of the chloroform is complete, fill the carbon tube to the 30-cc. mark, swirl it vigorously to dissolve any alcohol carried over with the chloroform, and then tap the carbon tube sharply on the desk to collect any globules of chloroform adhering to the walls.



Chloroform Determination Apparatus

Finally, place the carbon tube in a bath of water at 25° C., and read the volume of chloroform when that temperature has been attained.

Chromic Acid Cleansing Mixture

Sodium Dichromate.....	200 Gm.
Water.....	100 cc.
Sulfuric Acid.....	1500 cc.

Dissolve the sodium dichromate in the water, then add the sulfuric acid slowly and with stirring.

Congealing Temperature

Unless otherwise directed, place about 10 cc. of the liquid or 10 Gm. of the melted solid to be tested in a dry test tube of from 18 to 20 mm. internal diameter. Then cool in water or in a suitable freezing mixture, the temperature of which should be about 5 degrees lower than the supposed congealing point of the liquid. To induce congelation, rub the inner walls of the tube with a standard thermometer of Type I or Type II, page 623, or add a small solid piece of the substance being tested. By alternate immersion of the tube in the bath, or removal from the bath and constant stirring with the thermometer, the temperature is so adjusted that the greater part of the liquid gradually congeals. The highest temperature remaining constant for a short time during the congelation is defined as the congealing point.

Consistency of Petrolatum

Determine the consistency of petrolatum by means of a penetrometer having a scale calibrated in tenths of a millimeter, and a cone constructed of stainless steel or brass, with a detachable hardened steel or stainless steel tip, the outside surface of the cone having a very smooth finish. The tip of the cone shall have an angle of 30°, the point being truncated to a diameter of 0.38 mm. $\pm$ 0.08 mm. The base of the tip shall be 8.38 mm. $\pm$ 0.13 mm. in diameter, and the length of the tip 15 mm. $\pm$ 0.25 mm. The remaining portion of the cone shall have an angle of 90°, shall be 28.2 mm. in height, and shall have a maximum diameter at the base of 65.1 mm. The total moving weight of the cone shall be 150 Gm.

The vessel containing the petrolatum shall be placed in a bath at a temperature of 25° C. $\pm$ 0.5° until ready for the determination.

Procedure—Test all samples of petrolatum for original consistency after melting and cooling to the temperature of the test. Bring the samples to 25° C. $\pm$ 0.5° before the test. If the sample is initially within 1.5° to 2° C. of this temperature, it may be brought to 25° C. by placing it in a water bath for 40 minutes; but if the initial temperature is outside of this range, place the sample in the constant-temperature bath for 1½ hours to obtain the desired temperature. If the room temperature is more than 1.5° to 2° C. from 25° C., close the container tightly to prevent the entrance of water, and immerse the can in the bath for the required period.

In conducting the test, the surface of the sample must be cut level and very smooth with a knife, care being taken not to "work" the surface. Place the can of petrolatum on the penetrometer table, and lower the cone until the tip just touches the top surface of the sample. Watching the shadow of the tip is an aid to accurate

setting. Quickly release the plunger and hold it free for 5 seconds. The consistency is indicated by the total penetration as read from the scale.

The total surface area disturbed by the test will have a diameter about equal to the measured depth of penetration. In order to prevent one test from being affected by the disturbed area of a previous test or by the sides of the container, the tip must never be placed nearer the sides of the container or the edge of a previous hole than the penetration distance of that particular sample. The surface must not be smoothed over for subsequent tests. Make five such tests and report the average of the five as the consistency of the petrolatum if the mean deviation does not exceed 3 per cent. If the mean deviation exceeds 3 per cent, report the average of 10 determinations.

Containers for Injections

Containers for injections shall be so constructed and packaged that the quality and sterility of the contents are not impaired. As it is important to examine the appearance of the contents, containers for injections should be composed of clear glass not colored or clouded unless the contents are affected by light. Even in the case of the latter, enclosing the container or containers of clear glass in closed cartons, impervious to light, will protect the contents. The immediate container must be sterile before being filled unless the container and contents are subsequently to be sterilized by Process C or other suitable effective process.

The container must be sealed or otherwise protected so as to exclude all organisms. A container of multiple doses, designed to permit the withdrawal of successive volumes on different occasions, should be closed with a suitable rubber cap or other suitable closure.

Types of Glass Containers

Glass containers for injections must meet the following requirements:

Containers for Injections and other U. S. P. preparations for parenteral use other than those in oily vehicles, shall be of one of the following types:

- Type I. Glass containers of any capacity, conforming to the requirements on page 568.
- Type II. Glass containers of not over 100-cc. capacity, conforming to the requirements on page 568.
- Type III. Glass containers of any capacity, conforming to the requirements on page 569.
- Type IV. Glass containers of over 100-cc. capacity conforming to the requirements on page 569.

Glass containers which satisfy the requirements for Type I may be of any capacity and may be used for any preparation.

When containers of Type II are directed in a monograph, containers of Type I may be used.

When containers of Type III are directed in a monograph, containers of Type I may be used in any capacity, those of Type II if the capacity be not over 100 cc., and those of Type IV if the capacity be greater than 100 cc.

When containers of Type IV are directed in a monograph, containers of Type I of the same capacity may be used.

When containers of Type II and Type III are used, they must be sterilized by dry heat prior to filling.

Containers of Type II and Type III are designed only for U. S. P. preparations that are sterilized in bulk, then filled into previously sterilized containers under aseptic conditions.

Containers shall be of transparent glass. When protection from light is required, the container preferably shall be placed in an opaque outer container.

The container must be sealed or otherwise properly closed to exclude the entrance of all organisms. Containers packaged for multiple doses, so as to permit the withdrawal of successive volumes on different occasions, should be closed with a suitable rubber cap or other suitable stopper.

Test for containers of Type I—Take a sufficient number of containers at random, not less than 6, cleanse them thoroughly, rinse in distilled water and dry. Crush the containers to about 1-inch size and take from 100 to 120 Gm. of the well-mixed glass and reduce it to a powder in a suitable steel mortar. Place the powder on a No. 20 sieve nested in a No. 40 sieve, which in turn is nested in a No. 50 sieve, and sift briefly. Remove the glass on the No. 20 and No. 40 sieves, recrush in the mortar, and sift a second time. Again remove the glass on the No. 20 and No. 40 sieves, crush again, and sift for the third time. Return the glass retained on the No. 40 and No. 50 sieves to the sieve assembly and sift again for 5 minutes. A mechanical sieve shaker, page 585, may be used if desired. Spread the glass powder retained on the No. 50 sieve, which should weigh from 10 to 15 Gm., on a sheet of paper and pass a magnet through it several times to remove any particles of iron. Transfer the powder to a small basket of No. 50 brass or copper gauze and agitate the basket containing the powder in a beaker of distilled water for 1 minute and then for 30 seconds in each of 2 beakers of alcohol. At this time, the particles should be of uniform size and free from small particles or agglomerates of powder. Dry the washed sample at 140° C. for 20 minutes and cool in a desiccator. Place 10 Gm. of the dried glass, accurately weighed, in a resistance glass flask of about 125-cc. capacity, add 40 cc. of distilled water which has not come in contact with copper, loosely cap the flask with a resistance glass cover, and autoclave for 30 minutes at 15 pounds steam pressure (121.5° C.). Cool the autoclave to atmospheric pressure within 30 minutes, then remove the flask, cool rapidly to room temperature, and titrate with fiftieth-normal sulfuric acid, using phenol red pH indicator. Perform a blank test with distilled water from the same lot and using the same kind of flask, and make any necessary correction: not more than 0.6 cc. of fiftieth-normal sulfuric acid is consumed.

Test for containers of Type II—Take a sufficient number of containers at random, not less than 6, and rinse them six times with distilled water. Fill each container to its rated capacity with distilled water at 80° C., which has not been in contact with copper, and which, just previous to use, has been boiled down to three-fourths of its original volume, and to which have been added subsequently 2 drops of phenolphthalein T.S. for each 100 cc. of water. Place the containers in a large beaker or other glass vessel and cover the vessel with an inverted crystallizing dish or clock glass so arranged that the condensate will fall outside the vessel, or, instead, cover each container with an inverted resistance glass beaker. Place the containers in an autoclave and heat at 15 pounds steam pressure (121.5° C.) for 1 hour. Cool the autoclave to atmospheric pressure within 30 minutes, remove the container and immediately titrate 100 cc. of the water, accurately measured and taking an equal

volume from each container, with fiftieth-normal sulfuric acid; not more than 0.5 cc. of fiftieth-normal sulfuric acid is required to discharge the pink color.

Test for containers of Type III—Take at least 6 containers at random if less than 100-cc. capacity, at least 3 if not over 500-cc. capacity, and at least 2 if not over 1000-cc. capacity. Cleanse them thoroughly, rinse in distilled water and dry. Crush the containers to about 1-inch size and take from 100 to 120 Gm. of the well-mixed glass. Reduce the glass to powder, as directed under the test for containers of Type I, and wash and dry the powdered glass retained on the No. 50 sieve as directed therein. Place 10 Gm. of the powdered glass, accurately weighed, in a 200-cc. Erlenmeyer flask of resistance glass, which has previously been digested with 50 cc. of fiftieth-normal sulfuric acid for 24 hours at 90° C., rinsed with distilled water, and dried. Add to the flask 50 cc. of fiftieth-normal sulfuric acid, accurately measured, and stopper the flask with a one-hole rubber stopper. Immerse the flask in a water bath previously heated to 90° C., so that the bottom of the flask is 2 inches below the surface of the water, and maintain the temperature of the bath at 90° C., $\pm$ 0.5° C., for 4 hours. Remove the flask, cool it quickly in running water, remove the stopper, and rinse into the flask with a small amount of distilled water. Add 5 drops of methyl red indicator and titrate with fiftieth-normal sodium hydroxide. Titrate a fresh 50-cc. portion of the same fiftieth-normal sulfuric acid to the same end-point. The difference between the two titrations corresponds to not more than 5 cc. of fiftieth-normal sulfuric acid.

Test for containers of Type IV—Take a sufficient number of containers at random, not less than 6, cleanse them thoroughly with hot water, and rinse them with distilled water. Nearly fill the containers with distilled water which has not come in contact with copper, invert resistance glass beakers over the openings of the containers and autoclave them for 30 minutes at 15 pounds pressure (121.5° C.). Cool the autoclave to about 100° C. within 30 minutes and remove the containers. Transfer an accurately measured suitable quantity, but not less than 100 cc. from each container, to a resistance glass beaker, add 1 cc. of diluted sulfuric acid, evaporate the solution to a volume of 30 to 40 cc., and transfer the contents to a previously ignited, tared, platinum dish. Evaporate the solution to dryness and ignite at a dull red heat to constant weight. Perform a blank test with distilled water from the same lot in the same manner and make any necessary correction: the total solids dissolved amount to not more than 3.5 parts per million.

NOTE—The most effective type of steel mortar used in the examination of containers of Types I and III for crushing the glass is commonly referred to as a "diamond" mortar. A suitable mortar and pestle may be made from "Oil Die" steel as follows: The mortar should have an external diameter of 3 inches and an overall height of $2\frac{3}{8}$ inches, and the outside edges should be slightly rounded. The cavity in the mortar should be $1\frac{3}{8}$ inches deep and have a diameter of exactly 2 inches. The angle at the bottom edge of the cavity should be turned to a radius of $\frac{1}{32}$ inch.

The solid pestle should have an overall length of $4\frac{1}{4}$ inches. The head of the pestle should have a width of $1\frac{3}{4}$ inches and a length of $1\frac{3}{4}$ inches. The bottom edge of the head should be turned to a radius of $\frac{1}{32}$ inch, and the upper edge be slightly rounded. The handle end of the pestle should be $1\frac{3}{16}$ inches in diameter, the junction of the handle and head be turned to a radius of $\frac{1}{4}$ inch, and the top edge should be slightly rounded. No deep tool marks should be left in the cavity of the mortar or on the head of the pestle.

The mortar and the head of the pestle should be hardened by heating to 840° C., (1550° F.), quenching in oil, and drawing at 150° C. (300° F.). The inner surface of the mortar and the surface of the head should be cleaned with emery cloth after hardening. The top inch of the handle should be left soft.

To crush the glass, put from 30 to 40 Gm. of the glass, in not over 1-inch pieces, into the mortar, insert the pestle, and strike the pestle four sharp blows with a 2-pound hammer.

To screen the crushed glass, nest together Nos. 20, 40, and 50 sieves with a sieve pan underneath, and place the sieve assembly in a mechanical sieve shaker, page 585. The No. 20 sieve is used to reduce abrasion of the No. 40 sieve. The glass remaining on the No. 20 and No. 40 sieves is returned to the mortar for further crushing after all of the glass has been reduced for the first time.

Screening is preferably done on a mechanical sieve shaker, page 585, in which the nested sieves may be shaken. If necessary to screen by hand, place each crushing from the mortar in turn on the No. 20 sieve fitted with the pan, hold the sieve in one hand while slightly inclined, and tap the side of the sieve against the palm of the other hand at the rate of about 150 times per minute for 1 minute, turning the sieve about one-sixth of a revolution after each 25 strokes, and repeat the operation with the No. 40 and No. 50 sieves.

Suggested Types of Glass Containers for Preparations for Injection

It is suggested that the following glass container types be used for aqueous preparations for injection for the substances listed below. No suggestions are offered for injections made with an oil medium.

Aqueous Parenteral Solutions	Types of Glass
Anticoagulant Solution of Sodium Citrate.....	Type I or IV
Bismuth and Potassium Tartrate.....	Type I
Caffeine and Sodium Benzoate.....	Type I
Calcium Gluconate.....	Type I, II or III
Dextrose.....	Type I, II or IV
Dextrose and Sodium Chloride.....	Type I or IV
Digitalis.....	Type I
Emetine Hydrochloride.....	Type I
Epinephrine Hydrochloride.....	Type I or III
Liver (sterilized in container).....	Type I
Liver (sterilized in bulk).....	Type I, II or III
Histamine Phosphate.....	Type I or II
Insulin Injection.....	Type I, II or III
Isotonic Solution of Sodium Chloride.....	Type I or IV
Isotonic Solution of Three Chlorides.....	Type I or IV
Mercuraphylline.....	Type I
Mersalyl and Theophylline.....	Type I
Neostigmine Methylsulfate.....	Type I
Ouabain.....	Type I
Parathyroid.....	Type I or III

Aqueous Parenteral Solutions	Types of Glass
Phenolsulfonphthalein	Type I
Picrotoxin	Type I or III
Posterior Pituitary	Type I
Quinine Hydrochloride with Ethyl Carbamate	Type I
Strophanthin	Type I
Sulfobromophthalein Sodium	Type I
Theophylline Ethylenediamine	Type I
Water for Injection	Type I or IV

Stoppers for Containers

Caps or stoppers used for closing containers are to be made from good quality material. They are to be cleansed by boiling in several changes of water and then rinsed in the water for injection, or by other suitable processes, placed in covered wide-mouth containers, and sterilized by Process C. Large rubber stoppers are to be individually wrapped before sterilization, and must be long enough to be inserted and removed without contaminating the lip of the container. The sterilized wrapper of the rubber stopper or other suitable sterilized cover may be employed as a cap. Non-absorbent cotton stoppers if used to close extemporaneously prepared injections should be wrapped in layers of gauze and capped with suitable metallic foil or stout paper.

Containers, Standards for Light Transmission

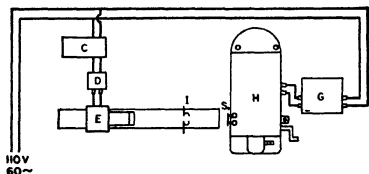
Apparatus—Several makes of apparatus of suitable sensitivity and accuracy are available. Among these are the Coleman Spectrophotometer, the General Electric Recording Spectrophotometer, and the Cenco-Sheard Spectrophotometer. Other instruments of equivalent accuracy may be used.

The description given below applies to the Cenco-Sheard instrument; the essential features, or their equivalents, may be found in other instruments. Detailed directions for their operation are furnished by the manufacturer.

The optical system of the photo-electric spectrophotometer (H) is mounted within a dust-proof metal housing. It consists of an entrance slit (S) from which light is directed with a mirror to a concave diffraction grating, an exit slit, an absorption cell carriage, and a photocell.

A crank on the right side of the housing operates a mechanism which rotates and shifts the grating, causing the first order spectrum to traverse the slit, and keeping the portion of the spectrum falling on the slit in focus. A revolution counter located above the crank registers the wave length of the light to the nearest millimicron at the center of the slit. An eyepiece with crosshair and reflecting prism is provided on top of the housing for visual scanning of the spectrum. It is introduced into the light path in front of the exit slit by pushing it downward in the mounting tube. In this position, the light seen at the crosshair is of the wave length indicated by the revolution counter. The absorption cell carriage, made to carry two cells, is located between the exit slit and the photocell.

A galvanometer (G) of high sensitivity is required to indicate the photocell current. One visual spectrum light source (E) with transformer (D), one high pressure mercury arc with transformer (for measurements down to $3340 \text{ \AA}$), one constant voltage transformer (C), one quartz condensing lens, two filters, one iris diaphragm, and a bench support are necessary accessories. A schematic diagram of the spectrophotometer is given in the illustration.



Schematic Diagram of Photo-electric Spectrophotometer with Light Source and Transformers

Preparation of Sample—If the container material is homogeneous throughout its thickness with regard to transmission of light, the samples should be prepared approximately 2 mm. in thickness with plane polished parallel surfaces.

The sample size should be that accommodated by the particular instrument to be used for the measurement. If the surface of the container material has been treated in order to affect its light transmission properties, the efficacy of this treatment shall not be impaired in the preparation of the sample. In no case shall the sample be of more than 2 mm. in thickness, unless the material is homogeneous in color throughout its thickness.

Measure the thickness of the test specimen to an accuracy of 0.01 mm. Clean the surfaces of the glass thoroughly, and be careful when placing the sample in the instrument to see that no fingerprints are left on the surfaces through which light must pass. Place the test specimen in the right-hand compartment of the absorption cell carriage so that it is normal to, and covers, the opening in the compartment. Leave the left-hand compartment empty.

Procedure—Set up the visual spectrum light source (ribbon filament lamp) for measurements in the range from $4100 \text{ \AA}$ to $7500 \text{ \AA}$ (see spectrophotometric illustration). Carefully adjust the lamp bulb so that the center of the filament is on the axis of the optical system. Focus the light so that the image of the filament just covers the slit. Adjust the entrance slit to a width of 1.5 mm., and insert the $100 \text{ \AA}$ exit slit. If the glass being tested has a very low transmission factor, wider slits must be used. However, if the glass contains narrow absorption bands, both slits must be made narrow accordingly.

Set the wave length indicator to 420 by turning the crank in a clockwise direction. If the indicator is turned past this point, it must be reset after the crank has been turned four or five revolutions in a counter-clockwise direction. Place the blank compartment in the light path and note the deflection (I_0) of the galvanometer. Adjust the iris diaphragm to bring the galvanometer deflection between 80 and 100. Record this reading as shown on the typical data sheet, page 574. Immediately move the compartment containing the test sample into the light path and record the deflection (I). The ratio I/I_0 is the transmission factor of the glass for the wave length shown on the indicator. Make measurements at successive intervals of $200 \text{ \AA}$. Insert a red filter (Cenco No. 87308-B610) in the filter holder in front of the entrance slit for all measurements above $6500 \text{ \AA}$. No filter is needed for measurements between $4100 \text{ \AA}$ and $6500 \text{ \AA}$. In some instances, narrow absorption

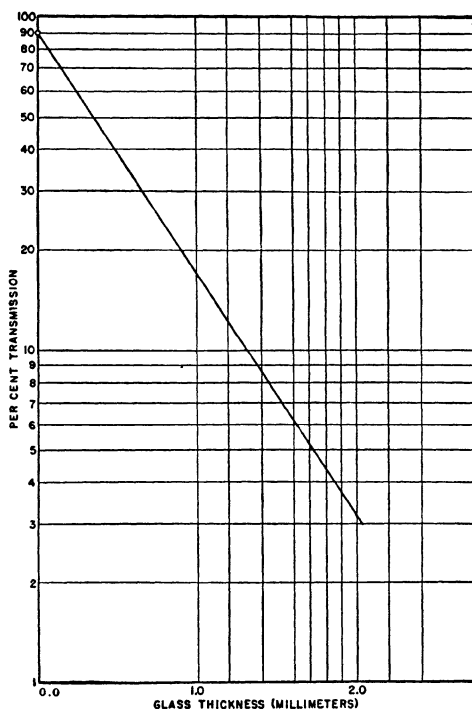
bands may be encountered, in which cases more frequent measurements are necessary.*

To make measurements below $4100 \text{ \AA}$, set up the mercury arc light, using the quartz condensing lens to focus the image of the light source on the slit. Insert a blue filter (Cenco No. 87308-335) in the filter holder. Set the indicator on the wave length of a principal line in the mercury spectrum, which falls near the lower limit of wave lengths for which measurements are desired. Obtain transmission factors at the successive principal lines of the mercury spectrum up to $4050 \text{ \AA}$, as outlined above.

In order to compare the transmission values of two glasses, the transmission factors must be obtained on the basis of a common glass thickness, and curves plotted of per cent transmission against wave length. A thickness of 2.0 mm. is taken as the basis of comparison. It is quite difficult to polish all of the samples to be tested to exactly the same thickness; therefore, the following graphical method of converting the transmission factor of a glass from one thickness to the factor for another thickness is suggested.

Prepare a chart on a sheet of 2-cycle, semi-logarithmic paper (Keuffel and Esser, No. 359-63; see illustrations of typical graphs for recording transmission factors) by laying off any convenient scale on the equal parts side to include the thickness of the sample tested, and the thickness for which transmission factors are desired. Draw lines on the graph to represent each of these thicknesses.

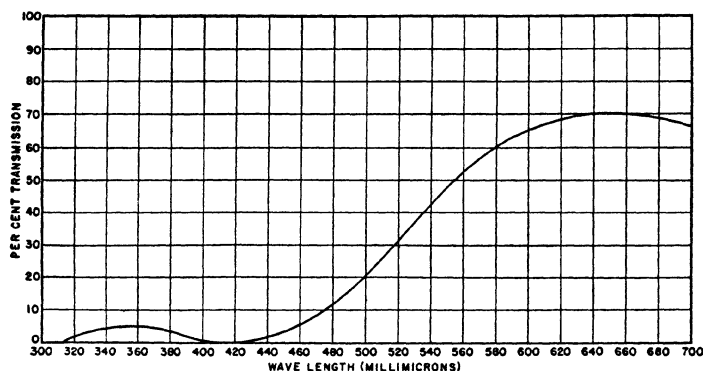
Mark off the logarithmic scale in per cent, as indicated. This scale represents the amount of light transmitted by the glass after correction for reflection losses, which amount to about 4 per cent of the incident light



Typical Graph for Recording the Transmission Factor for Glass

* The intensity of the visual spectrum light source is fairly constant over the range in which it is used up to about $6800 \text{ \AA}$.

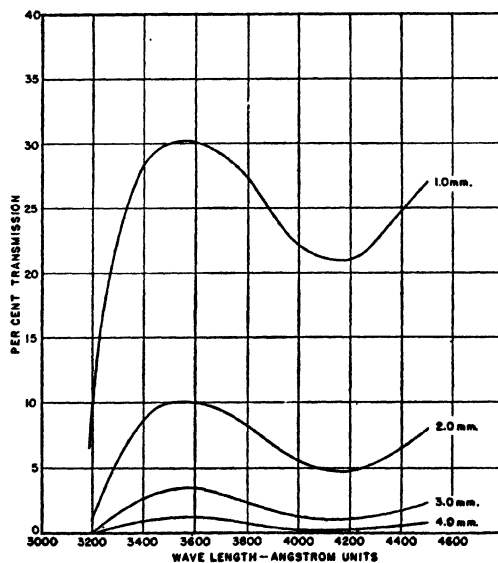
Therefore, to detect absorption bands in the visible region, place the test sample in the light path, and traverse the range of wave lengths over which measurements are to be made. Any sudden change in the deflection (I) of the galvanometer will indicate an absorption band at the wave length where the sudden change in deflection occurred.



Characteristic Spectral Transmission Curve of an Amber Glass

on each surface. Since the transmission factors are not corrected for reflection losses, 92 per cent must be taken as the maximum per cent transmission, or as a basis for the graphical calculation.

Draw a straight line through the 92 per cent point at zero thickness, and any transmission factor for a glass at its measured thickness, to obtain the correct transmission factor of this glass at any other thickness. On the graph, a transmission of 5.3 per cent at 1.7 mm. glass thickness is converted to 3.2 per cent transmission for a thickness of 2.0 mm.



Spectral Transmission of Amber Glass for Different Thickness from 1.0 Mm. to 4.0 Mm.

Typical Data Sheets—

Sheet I—Following are a typical data sheet and transmission curve for an amber glass:

Wave Length, m μ	I_0	I	Transmission Factor	
			$T_1 = 1.7$ Mm.	$T_2 = 2.0$ Mm.
313		0	0	0
334	6.6	0.40	0.061	0.037
365	100	8.3	0.083	0.055
385	20.0	1.06	0.053	0.032
405	100	3.4	0.034	0.019
420	95.2	3.05	0.032	0.018
440	90.0	4.95	0.055	0.032
460	86.7	8.3	0.096	0.065
480	89.2	14.4	0.162	0.120
500	92.3	24.0	0.260	0.210
520	96.5	34.9	0.362	0.310
540	87.2	41.8	0.480	0.432
560	98.0	55.6	0.568	0.528
580	94.0	59.4	0.632	0.595
600	88.5	60.5	0.684	0.643
620	91.5	64.4	0.703	0.672
640	89.2	64.2	0.719	0.689
660	81.0	58.3	0.719	0.689
680	37.2	26.5	0.712	0.682
700	15.0	10.6	0.705	0.674

Measurements in the ultra-violet were made at the principal lines of mercury.

Sheet II—Transmissions at various wave lengths between 2900 and 4500 Å for various thicknesses of an amber glass when maximum transmission in 2.0 mm. thickness is 10%. A typical glass was chosen for the "standard" data. Transmissions include loss by reflection.

Wave Length, Å	(Standard)			
	1.0 Mm.	2.0 Mm.	3.0 Mm.	4.0 Mm.
2900	?	0	0	0
3000	?	0	0	0
3100	?	0	0	0
3200	11.0	1.3	0.15	0.02
3300	23.4	6.0	1.54	0.39
3400	28.8	9.0	2.80	0.87
3500	30.1	10.0	3.30	1.10
3600	30.1	10.0	3.30	1.10
3700	29.0	9.2	2.90	0.92
3800	27.0	8.0	2.35	0.69
3900	24.0	6.5	1.70	0.45
4000	22.1	5.4	1.30	0.31
4100	21.0	4.8	1.10	0.25
4200	21.0	4.8	1.10	0.25
4300	22.6	5.6	1.35	0.34
4400	25.0	6.8	1.75	0.46
4500	27.0	8.0	2.40	0.70

Diameter of Sutures

The gage for determining the diameter of sutures shall be of the dead-weight type, equipped with a dial graduated to read directly to 0.001 inch (0.0254 mm.). The table or anvil of the gage shall be about 2 inches in diameter. The presser foot shall be circular with a diameter of 0.5 inch $\pm$ 0.0005 inch (12.7 mm. $\pm$ 0.02 mm.). The presser foot and moving parts connected therewith shall be weighted so as to apply a total load of 7.4 oz. $\pm$ 0.1 oz. (210 Gm. $\pm$ 3 Gm.) to the specimen. The presser foot and anvil surfaces shall be plane to within 0.0002 inch and parallel to each other to within 0.0002 inch.

Surgical Gut—Determine the diameter of Surgical Gut immediately after removal from the tube and without stretching. Lay the strand across the anvil in such position as to cross the center of the anvil and presser foot, and lower the foot until its entire weight rests upon the suture. Determine the diameter of each strand at three quarterly points of its length. At least 2 of the measurements of not less than 10 strands from any lot of 12 tubes shall conform to the required diameter for the size indicated on the label, and at least one measurement of each of the remaining strands shall conform to the requirement. In no case shall any measurement vary more than the required diameter of the size next above or below.

Surgical Silk—The diameter of Surgical Silk is to be determined after the Silk has been exposed, for at least four hours, to an atmosphere having a relative humidity of 65 per cent $\pm$ 2 per cent, and a temperature of 21° C., $\pm$ 1.1° C. (70° F., $\pm$ 2° F.). The diameter of Sterile Surgical Silk, if packaged dry, is to be determined after conditioning as directed above. When Sterile Surgical Silk has been packaged in a tubing fluid, its diameter is to be determined immediately after removal from the fluid, without preliminary drying or conditioning.

Attach one end of the strand of Silk to a fixed clamp and lay the strand across the anvil in such position as to cross the center; while having the strand of silk and the surface of the anvil in the same plane, pass the free end of the strand around a cylinder or pulley, and attach to the free end a weight of approximately one-fourth the required minimum tensile strength of the strand, taking care not to permit the strand, if of twisted silk, to untwist. Determine the diameter at three quarterly points on the strand, and calculate the average diameter of 5 strands taken from any one lot. The required tension may be applied to the strand in other fashions, provided the strand rests flatly across the anvil of the gage.

When determining the diameter of braided silk, if the strand is of angular cross section, the diameter is to be measured between opposite flat sides of the strand.

Fats and Fatty Oils

Preparation of Sample—If a sample of oil shows turbidity owing to separated stearin, warm the container in a bath of water at 50° C. until the turbidity has disappeared and the oil is clear. Thoroughly mix the clarified oil before weighing the samples. If the oil does not become clear on warming, filter it through dry filter paper in a funnel contained in a hot water jacket. Weigh at one time as many portions as are needed for the various determinations, using preferably a bottle having a pipette dropper, or a weighing burette. Keep the sample melted, if solid at room temperature, until the desired samples are withdrawn.

Specific Gravity—The specific gravity of a fat or oil shall be determined at 25° C.,

except when the substance is a solid at that temperature. In this case the specific gravity shall be determined at the temperature directed in the respective monograph and referred to water at 25° C.

Clean a pycnometer (use a Sprengel pycnometer or a Squibb pycnometer with a well-fitted capillary stopper) by filling it with a chromic acid cleansing mixture, page 566, and allowing it to stand for at least 4 hours. Empty the pycnometer, and rinse it thoroughly with distilled water; then fill it with recently boiled distilled water previously cooled to about 20° C., and place in a constant temperature bath at 25° C. At the end of 30 minutes adjust the level of the water to the proper point on the pycnometer; put the perforated cap or stopper in place; remove from the bath, wipe dry with a clean cloth, free from lint; and after allowing to stand for 30 minutes, weigh. Empty the pycnometer, rinse several times with alcohol and then with ether, allow it to become perfectly dry, remove any ether vapor, and weigh. Ascertain the weight of the contained water at 25° C. by subtracting the weight of the pycnometer from its weight when full.

Fill the clean, dry pycnometer with the oil at a temperature below that at which the determination is to be made; place it in a constant temperature bath at the specified temperature for 30 minutes; adjust the level of the oil to the proper point on the pycnometer; put the cap or stopper in place, wipe dry; allow to stand for 30 minutes; and weigh. Subtract the weight of the empty pycnometer from its weight when filled with oil, and divide the difference by the weight of water contained at 25° C. The quotient is the specific gravity at the temperature of observation, referred to water at 25° C.

Index of Refraction—The index of refraction shall be determined by means of the Abbé refractometer. The determination shall be made at the temperature specified for each oil, maintaining the temperature by circulating water at the proper temperature through the heating jackets surrounding the prisms of the refractometer.

Melting Point—Determine the melting point as directed for substances of Class II, page 595.

Solidification Temperature of Fatty Acids. (Frequently referred to as the "titer.")

Preparation of the Fatty Acids—Heat 75 cc. of glycerin-potassium hydroxide solution (made by dissolving 25 Gm. of potassium hydroxide in 100 cc. of glycerin) to 150° C. in an 800-cc. beaker, and add 50 cc. of the clarified fat, melted if necessary. Heat the mixture for 15 minutes with frequent stirring, but do not allow the temperature to rise above 150° C. When saponification is complete, the mixture is homogeneous, with no particles clinging to the beaker at the meniscus. Pour the soap into 500 cc. of nearly boiling distilled water in an 800-cc. beaker or casserole, add slowly 50 cc. of dilute sulfuric acid (made by adding 1 volume of sulfuric acid to 3 volumes of distilled water), and heat the solution with frequent stirring, until the fatty acids separate cleanly as a transparent layer. Wash the acids with boiling water until free from sulfuric acid, collect them in a small beaker, and place on a boiling water bath or steam bath until the water has settled and the fatty acids are clear. Allow the acids to cool, melt, and filter into a dry beaker while hot, and dry for 20 minutes at 100° C.

Test for Complete Saponification—Place 3 cc. of the dry acids in a test tube and add 15 cc. of alcohol. Heat the solution to boiling and add an equal volume of ammonia water. A clear solution should result.

Determination of the Solidification Temperature—Cool the dry, filtered acids to

from 15 to 20 degrees above the expected reading, and transfer to a glass tube 25 mm. in diameter and 100 mm. in length, the glass being 1 mm. in thickness. By means of a perforated cork fasten the tube in a wide-mouth bottle of clear glass, approximately 70 mm. in diameter and 150 mm. in height. Suspend a thermometer of Type V, page 623, in the melted acids so that it will serve as a stirrer, cooling if necessary, and stir the mass slowly until the mercury remains stationary for 30 seconds. Then allow the thermometer to hang quietly, with the bulb in the center of the acids, and observe the rise of the mercury column. The highest point to which it rises is the Solidification Temperature of the fatty acids.

Acid Value (Free Fatty Acids).

The acid value is the number of milligrams of potassium hydroxide required to neutralize the free acids in 1 Gm. of substance. The acidity may also be expressed as the number of cubic centimeters of tenth-normal sodium hydroxide required to neutralize the free acid in 10 Gm. of substance. The acidity of fats, oils, waxes, fatty acids, resins, and balsams is determined by dissolving a weighed quantity of the sample in alcohol or a mixture of equal volumes of alcohol and ether (either solvent having been neutralized with dilute sodium hydroxide to a phenolphthalein end-point), adding phenolphthalein T.S. as the indicator, and titrating with standard sodium hydroxide solution to a pink color that persists after shaking the mixture for 30 seconds.

The method: Unless otherwise directed, dissolve about 10 Gm. of the substance, accurately weighed, in 50 cc. of a mixture of equal volumes of alcohol and ether (which has been neutralized to phenolphthalein with tenth-normal sodium hydroxide) contained in a flask. If the sample does not dissolve in the cold solvent, connect the flask with a reflux condenser and warm slowly, with frequent shaking, until the sample has dissolved. Add 1 cc. of phenolphthalein T.S. and titrate with tenth-normal sodium hydroxide until the solution remains faintly pink after shaking for 30 seconds. Calculate either the *Acid Value* or the volume of tenth-normal alkali required to neutralize exactly 10 Gm. of sample, as directed.

If the oil has been saturated with carbon dioxide for the purpose of preservation, the solution in alcohol-ether must be boiled gently for 10 minutes under the reflux condenser before titration. The oil may also be freed from carbon dioxide by exposing it in a shallow dish in a vacuum desiccator for 24 hours before weighing the samples.

Ester Value.

The Ester Value is the number of milligrams of potassium hydroxide required to saponify the esters in 1 Gm. of fatty or volatile oil, fat, wax, resin, balsam, or similar organic substance. If the Saponification Value and the Acid Value have been determined, the difference between these two represents the Ester Value.

To determine the Ester Value directly, proceed as follows: Shake from 1.5 to 2 Gm. of the substance, accurately weighed in a 200- to 250-cc. tared flask, with from 20 to 30 cc. of alcohol, add 1 cc. of phenolphthalein T.S., and titrate with half-normal alcoholic potassium hydroxide until the free acid is neutralized. Add exactly 25 cc. of half-normal alcoholic potassium hydroxide, and proceed as directed under *Saponification Value*, beginning with "Insert in the neck of the flask" and omitting the further addition of phenolphthalein T.S. The difference between the

number of cc. of half-normal hydrochloric acid consumed in the actual test and in the blank, multiplied by 28.05 and divided by the weight of the substance taken, gives the Ester Value.

Iodine Value (*Hanus method*).

The Iodine Value of a fat or oil represents the number of grams of iodine capable of being absorbed, under the prescribed conditions, by 100 Gm. of the substance. It is determined as follows: Introduce about 0.8 Gm. of a solid fat or about 0.3 Gm.* of an oil, accurately weighed, into a glass-stoppered flask or bottle of 250-cc. capacity, dissolve it in 10 cc. of chloroform, add 25 cc. of iodobromide T.S., accurately measured from a burette or pipette, stopper the vessel securely, and allow it to stand for thirty minutes† protected from light. Then add in the order named 30 cc. of potassium iodide T.S. and 100 cc. of distilled water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, shaking thoroughly after each addition of thiosulfate. When the iodine color becomes quite pale, add 1 cc. of starch T.S. and continue the titration with thiosulfate until the blue color is discharged. Carry out a blank test at the same time with the same quantities of chloroform and iodobromide solution, allowing it to stand for the same length of time and titrating as directed. The difference between the number of cc. of thiosulfate consumed by the blank test and the actual test, multiplied by 1.269 and divided by the weight of sample taken, gives the Iodine Value.

NOTE—If more than half of the iodobromide T.S. is absorbed by the portion of the substance taken, the determination must be repeated, using a smaller portion of the substance under examination.

Saponification Value.

The Saponification Value is the number of milligrams of potassium hydroxide required to neutralize the free acids and saponify the esters contained in 1 Gm. of a fat, fatty or volatile oil, wax, resin, balsam or similar substance. It is determined as follows: Place from 1.5 to 2 Gm. of the sample, accurately weighed, in a flask of from 200- to 250-cc. capacity, and add to it exactly 25 cc. of alcoholic half-normal potassium hydroxide. Insert into the neck of the flask, by means of a perforated stopper, an air condenser consisting of a glass tube from 70 to 80 cm. in length and from 5 to 8 mm. in diameter, and heat the flask on a water bath for 30 minutes, frequently rotating the contents. Then add 1 cc. of phenolphthalein T.S. and titrate the excess of potassium hydroxide with half-normal hydrochloric acid. Make a blank test at the same time, using exactly the same amount of alcoholic half-normal potassium hydroxide. The difference between the number of cc. of half-normal hydrochloric acid consumed in the actual test and in the blank test, multiplied by 28.05 and divided by the weight of sample taken, gives the Saponification Value.

If the oil has been saturated with carbon dioxide for the purpose of preservation, it should be exposed in a shallow dish in a vacuum desiccator for 24 hours before the portions are weighed for this determination.

* 0.12 to 0.15 Gm. of linseed oil or of cod liver oil, 0.8 to 1.0 Gm. of oil of theobroma.

† Allow to stand for 1 hour in the case of castor oil, cod liver oil, or linseed oil.

Unsaponifiable Matter.

The term Unsaponifiable Matter in oils or fats refers to those substances present that are not saponifiable by alkali hydroxides and are insoluble in water. It is determined as follows: Weigh 5 Gm. of the oil or fat into a 250-cc. Erlenmeyer flask, add a solution of 2 Gm. of potassium hydroxide in 40 cc. of alcohol, and heat under a reflux condenser for 2 hours, keeping the alcohol gently boiling. Evaporate the alcohol on a water bath, dissolve the residue in 50 cc. of hot distilled water, and transfer the solution to a separator, rinsing the flask with two 25-cc. portions of hot distilled water which are added to the separator. Cool to room temperature, and extract with two successive portions of 50 cc. each of ether, adding a few drops of alcohol to facilitate the separation of the two liquids. Combine the ether extracts in another separator and wash the ether solution first with 20 cc. of an aqueous solution of sodium hydroxide (4 in 1000), then with 20 cc. of an aqueous solution of sodium hydroxide (8 in 1000), and finally with 15-cc. portions of distilled water until the last washing is not reddened by the addition of 2 drops of phenolphthalein T.S. Transfer the ethereal solution to a tared beaker, and rinse the separator with 10 cc. of ether, adding the rinsings to the beaker. Evaporate the ether just to dryness on a water bath, and dry the residue for 30 minutes at 100° C. Cool the beaker in a desiccator for 30 minutes, and weigh the residue of Unsaponifiable Matter.

Water and Sediment in Fatty Oils.

The Centrifuge—The preferred centrifuge shall have a diameter of swing (tip to tip of whirling tubes) of from 38 to 43 cm. and be operated at a speed of about 1500 r.p.m. If a centrifuge of different dimensions is used, the rate of revolution shall be calculated by the use of the following formula: $r.p.m. = 1500 \sqrt{\frac{40.6}{d}}$ in which "d" represents the diameter in cm. (from tip to tip of the whirling tubes) of the centrifuge used.

The Centrifuge Tubes—The centrifuge tubes shall be pear-shaped, shall be made of suitable glass, and thoroughly annealed. The total capacity of each tube shall be about 125 cc. and the mouth shall be suitably constricted for closing with a cork. The graduations shall be clear and distinct, reading upward from the bottom of the tube. The tube shall be graduated according to the following scale:

Range	Scale Division
0 to 3 cc.....	0.1 cc.
3 to 5 cc.....	0.5 cc.
5 to 10 cc.....	1.0 cc.
10 to 25 cc.....	5.0 cc.
25 to 50 cc.....	25.0 cc.
50 to 100 cc.....	50.0 cc.

Method—Place exactly 50 cc. of benzene in each of two centrifuge tubes and to each tube add exactly 50 cc. of the oil, warmed if necessary to reincorporate separated stearin, and thoroughly mixed at 25° C. Tightly stopper the tubes and shake them vigorously until the contents are thoroughly mixed, then immerse the tubes in a water bath at 50° C. for 10 minutes. Place the tubes on opposite sides of the centrifuge and whirl for 10 minutes. Read the combined volume of water and sediment at the bottom of each tube. Repeat the whirling for 10-minute periods until

the combined volume of water and sediment remains constant for three consecutive readings. The sum of the volumes of combined water and sediment in the two tubes represents the percentage, by volume, of water and sediment in the oil.

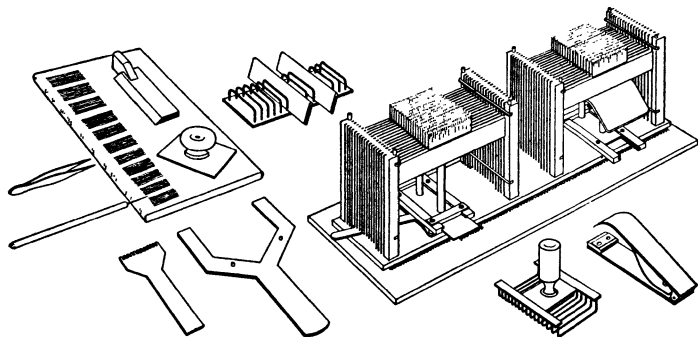
Fiber Length of Cotton

For the determination of the length and of the length distribution of cotton fibers in purified cotton.

Carry out all operations associated with the determination of fiber length of purified cotton in an atmosphere maintained at 65 per cent, $\pm$ 2 per cent, relative humidity at 21° C., $\pm$ 1.5° C. (70° F., $\pm$ 2° F.).

For the sake of definiteness, these directions describe the mode of procedure that is well adapted to the sorter* most extensively used in the United States at the present time.

Test Apparatus—The sorter (see illustration) consists of two banks of combs rigidly mounted side by side on a common base. Each bank of combs consists of at least 12 individual combs spaced $\frac{1}{8}$ inch apart, one behind the other, and mounted in grooves so that as they are approached during the fractionating process and no longer needed, they may be dropped below the working plane. Each individual comb has a single row of accurately aligned and sharply pointed teeth, $\frac{1}{2}$ inch long, consisting of needles 0.015 inch in diameter. The teeth are spaced 62 to the inch, over an extent of approximately 2 inches.



Duplex Cotton Fiber Sorter

Accessory Equipment—Fiber-sorter forceps, fiber-depressing grid, fiber-depressing smooth plate, and velvet-covered plates. The sorter forceps consist of two brass pieces approximately 3 inches long, hinged on one end and slightly curved to present a beaked aspect at the gripping end for gripping the protruding fibers close to the surfaces of the combs. Usually, one of the gripping edges has a leather or other fibrous padding. The gripping edge is approximately $\frac{3}{4}$ inch wide.

The fiber-depressing grid consists of a series of brass rods spaced $\frac{1}{8}$ inch apart so that they may be placed between the combs to press the fibers down between the teeth. The fiber-depressing smooth plate consists of a polished brass plate approxi-

* **NOTE**—The method here described is especially adapted to the Suter-Webb Duplex Cotton Fiber sorting apparatus, but with more or less obvious alteration in procedure, may be carried out with two Baer sorters in tandem arrangement, or with a Johannsen or other similar apparatus.

mately 1 by 2 inches, with a knob or handle on the upper surface whereby the plate may be smoothed over the fibers as they are laid on the velvet surface of the array plates. The velvet-covered plates upon which the fibers may be arrayed are aluminum sheets approximately 4 by 9 inches by $\frac{3}{32}$ inch thick, covered on both sides with high-grade velvet, preferably black.

Selection of Cotton—After unrolling the cotton, prepare a representative laboratory test specimen by taking from a package containing from 8 to 16 ounces, 32 pinches (about 75 mg. each) well distributed throughout the bulk of the lap, 16 representative pinches being taken from each longitudinal half of the lap. Avoid cotton fibers at the cut ends of the lap, and take particular care to secure portions throughout the thickness of the lap. To avoid biased selection of long or short fibers, all fibers of the group that is pinched must be removed and not allowed to slip from between the fingers.

From packages of not more than 4 ounces in weight, take 8 pinches, and from packages weighing more than 4 ounces and not more than 8 ounces, take 16 pinches, all well distributed.

Mix the pinches in pairs promiscuously and combine each pair by gently drawing and lapping them in the fingers. Then divide each combined pair by splitting longitudinally into two approximately equal parts and utilize one part in the further mixing. (The other part may be discarded or reserved for any further tests or checks.)

Repeat the process described in the preceding paragraph with the successive halves of the bifurcated series until only 1 pinch, the final composite test portion results. Gently parallel and straighten the fibers of the final composite test portion, by drawing and lapping them in the fingers. Take care to retain all of the fibers, including as far as possible those of the neps (specks of entangled fibers) and naps (matted masses of fibers), discarding only motes (immature seed fragments with fibers) and non-fiber foreign material such as stem, leaf, and fragments of seedcoats.

From the final composite portion described in the preceding paragraph, separate longitudinally a test portion of 75 mg., $\pm$ 2 mg., accurately weighed. Retain the residue for any check test if necessary.

The Test—Carefully insert and with the depressor press this weighed test portion into one bank of combs of the cotton sorter, so that it extends across the combs at approximately right angles.

With the sorter forceps grip by the free ends a small portion of the fibers extending through the teeth of the comb nearest to the operator; gently and smoothly draw them forward out of the combs, and transfer them to the tips of the teeth in the second bank of combs, laying them parallel to themselves, straight, and approximately at right angles to the faces of the combs, releasing the gripped ends as near to the face of the front comb as possible. Carefully press with the depressor grid the transferred fibers down into the teeth of the combs. Continue the operation until all of the fibers are transferred to the second bank of combs. During this transfer of the fibers, drop the combs of the first bank in succession when and as all of the protruding fibers have been removed.

Turn the machine through 180° and transfer the cotton fibers back to the *first bank* of combs in the manner described in the preceding paragraph.

Great care must be taken in evening up the ends of the fibers during both of the above transfers, arranging them as closely as possible to the front surface of the proximal comb. Such evening out of the ends of the protruding fibers may involve

drawing out straggling fibers both from the front and rear aspects of the banks of combs, and redepositing them into and over the main bundle in the combs.

Turn the machine again through 180°. Drop successive combs if necessary to expose the ends of the longest fibers. It may be necessary to redeposit some straggling fibers. With the forceps, withdraw the few most protuberant fibers. In this way continue to withdraw successively the remaining protuberant fibers back to the front face of the proximal comb. Drop this comb and repeat the series of operations in the same manner until all of the fibers have been drawn out. In order not to disturb seriously the portion being tested, and thereby vitiate the length fractionation into length groups, several pulls (as many as eight to ten) must be made between each pair of combs.

Lay the pulls on the velvet-covered plates alongside each other, as straight as possible, with the ends as clearly defined as possible, and with the distal ends arranged in a straight line, pressing them down gently and smoothly with the fiber-depressing smooth plate before releasing the pull from the forceps. Not less than 50 and not more than 100 pulls shall be employed to fractionate the test portion.

Group together all of the fibers measuring 12.5 mm. (about $\frac{1}{2}$ ") or greater in length, and weigh the group to the nearest 0.3 mg. In the same manner, group together all fibers 6.25 mm. (about $\frac{1}{4}$ ") or less in length, and weigh in the same manner. Finally, group the remaining fibers of intermediate lengths together and weigh. The sum of the three weights shall not differ from the initial weight of the test portion by more than 3 mg. Divide the weight of each of the first two groups by the weight of the test portion to obtain the percentage by weight of fiber in the two ranges of length.

Fineness of Powders

The fineness of powders in this Pharmacopœia is expressed in descriptive terms, each of which is related to the number assigned to a certain standard sieve.

Sieves for Pharmacopœial Testing—

Sieves for pharmacopœial testing shall be of wire cloth woven (not twilled) from brass, bronze, or other suitable wire, and shall not be coated or plated. The following table gives the nominal dimensions, permissible variations, and limits for woven wire cloth of standard sieves.

Nominal Dimensions of Standard Sieves

Microns	Number	Sieve Opening Mm.	Permissible Variation in Average Opening, Per cent	Permissible Variation in Maximum Opening, Per Cent	Wire Diameter, Mm.
9520	2	9.52	±3	+5	2.11 to 2.59
4760	4	4.76	±3	+10	1.14 to 1.68
2000	10	2.00	±3	+10	0.68 to 1.00
840	20	0.84	±5	+15	0.38 to 0.55
590	30	0.59	±5	+15	0.29 to 0.42
420	40	0.42	±5	+25	0.23 to 0.33
297	50	0.297	±5	+25	0.170 to 0.253
250	60	0.250	±5	+25	0.149 to 0.220
210	70	0.210	±5	+25	0.130 to 0.187
177	80	0.177	±6	+40	0.114 to 0.154
149	100	0.149	±6	+40	0.096 to 0.125
125	120	0.125	±6	+40	0.079 to 0.103
74	200	0.074	±7	+60	0.045 to 0.061

In any sieve, the average opening between the adjacent warp and the adjacent shoot wires, taken separately, shall conform to the width of opening specified within the specified percentage of permissible variation in the average opening. The maximum width of opening between any adjacent warp or shoot wires shall not exceed the width of opening specified by more than the specified percentage permissible variation in maximum opening. The average diameter of the warp and shoot wires, taken separately, of the cloth in any given sieve, shall be within the range of wire diameters given in the table.

For details regarding the standardization of sieves, reference should be made to National Bureau of Standards *Letter Circular* 72, July 26, 1922, or to Specification E11-39 of the American Society for Testing Materials.

Fineness of Powdered Vegetable or Animal Drugs—

The fineness of vegetable and animal drugs is expressed in this Pharmacopœia by the following terms: *Very coarse powder* (No. 8), *coarse powder* (No. 20), *moderately coarse powder* (No. 40), *fine powder* (No. 60), *very fine powder* (No. 80). A powder to conform with any one of these specified terms must meet the following requirements. In the preparation of ground or powdered drugs, no portion of the drug shall be rejected during milling or sifting unless specifically permitted under the official description of the drug. It is permissible, however, to withhold *final tailings* not exceeding 5 per cent of the drug being powdered, which may be added in no greater percentage to other lots of the same drug in subsequent millings.

Standards—

A *very coarse powder* (No. 8) is one in which all particles will pass through a No. 8 standard mesh sieve and not more than 20 per cent through a No. 60 standard mesh sieve.

A *coarse powder* (No. 20) is one in which all of the particles will pass through a No. 20 standard mesh sieve and not more than 40 per cent through a No. 60 standard mesh sieve.

A *moderately coarse powder* (No. 40) is one in which all of the particles will pass through a No. 40 standard mesh sieve and not more than 40 per cent through a No. 80 standard mesh sieve.

A *fine powder* (No. 60) is one in which all of the particles will pass through a No. 60 standard mesh sieve and not more than 40 per cent through a No. 100 standard mesh sieve.

A *very fine powder* (No. 80) is one in which all of the particles will pass through a No. 80 standard mesh sieve.

Fineness of Powdered Chemicals—

The fineness of chemicals is expressed in this Pharmacopœia by the following terms: *coarse powder* (No. 20), *moderately coarse powder* (No. 40), *fine powder* (No. 80), *very fine powder* (No. 120).

Standards—

A *coarse powder* (No. 20) is one in which all of the particles will pass through a No. 20 standard mesh sieve, and not more than 60 per cent will pass through a No. 40 standard mesh sieve.

A *moderately coarse powder* (No. 40) is one in which all of the particles will pass through a No. 40 standard mesh sieve, and not more than 60 per cent will pass through a No. 60 standard mesh sieve.

A *fine powder* (No. 80) is one in which all of the particles pass through a No. 80 standard mesh sieve.

A *very fine powder* (No. 120) is one in which all of the particles pass through a No. 120 standard mesh sieve.

Method for Determining Uniformity of Fineness—For determining uniformity of degree of fineness of powdered drugs, the following process may be used, employing standard testing sieves which meet the requirements set forth above.

For *very coarse*, *coarse* and *moderately coarse powders*, place from 25 to 100 Gm. of the powder to be tested upon the proper standard testing sieve with a tightly fitting receiving pan and cover. Shake the sieve in a rotary horizontal direction and vertically by tapping on a hard surface for not less than 20 minutes or until no appreciable number of particles pass through the sieve. Weigh accurately the amount remaining on the sieve and in the receiving pan and calculate to per cent.

In the case of *fine* or *very fine powders*, proceed as for *coarse* or for *moderately coarse powders*, but shake the sieve for at least 30 minutes or until no appreciable number of particles pass through the sieve.

In the case of oily or other powders which tend to clog the openings, the screen should be carefully brushed at intervals during the test. In the case of powders which tend to form lumps, such lumps should be carefully disintegrated during the sifting test. Do not increase the fineness of the powder during the sieve testing.

Mechanical Sieve Shaker*—The fineness of a powdered drug or chemical may also be determined by screening through standard sieves in a mechanical sieve shaker. The purpose of the sieve shaker is to reproduce the circular and tapping motion given to testing sieves in hand sieving but with a uniform mechanical action. A sieve or a nest of sieves rests upon a horizontal solid metal base plate which is attached to a bar one end of which is revolving in a circle 1.125 inches in diameter, the other traveling linearly to and from the center of rotation of the first, the bar measuring 14.75 inches between centers. The frequency of oscillation of the sieves is 285 ± 3 cycles per minute. At the top of the stack of sieves is placed a solid metal cover plate bearing a cork insert which projects 1 inch above the top surface of the cover plate. The cork insert is tapped at the top with a hammer striking a blow of 2.5 pounds, falling through a distance of 1.0625 inches at a rate of 150 times per minute. The cork insert must be replaced when necessary to retain the distance of the blow. The sieves are to be placed upon the sieve supporting plate, and the lower carrying plate so adjusted that it is just possible to make a complete turn of the cover plate with the unaided fingers.

Hardness of Soda Lime

Screen 200 Gm. of soda lime on a mechanical sieve shaker (see above), having a frequency of oscillation of 285 ± 3 cycles per minute for 3 minutes, to remove granules coarser than the labeled particle size and also granules finer than the labeled

* The description and manner of use given here apply specifically to the Ro-Tap Testing Sieve Shaker. Any other mechanical device which duplicates the shaking and tapping force and speed of this shaker may be used in pharmacopœial tests.

particle size. Weigh 50 Gm. of the properly sized granules, place them in a hardness pan together with fifteen $\frac{5}{16}$ -inch steel balls, and shake on the mechanical sieve shaker for 30 minutes. Remove the steel balls, brush the contents of the hardness pan onto a sieve of the finest mesh indicated on the label, and shake for 3 minutes on the mechanical sieve shaker: the weight of the soda lime remaining on the sieve, multiplied by 2, is the hardness.

The hardness pan must have a diameter of 8 inches and a concave brass bottom; the bottom of the pan must be $\frac{5}{16}$ -inch thick at the circumference and $\frac{1}{8}$ inch thick at the center, and have an inside spherical radius of curvature of 43 inches.

Heavy Metals Test

The Heavy Metals Test is designed to determine the content of those metallic impurities in official substances that are colored by hydrogen sulfide under the conditions of the test. In chemicals the proportion of any such impurity is expressed as the quantity of lead required to produce a color of equal depth in a standard comparison solution, this quantity being stated as the Heavy Metals Limit as equivalent parts of lead per million parts of the substance (by weight).

Reagents:

Diluted Acetic Acid—See page 647.

Hydrochloric Acid—All concentrations of hydrochloric acid used in the Heavy Metals Test must be prepared from reagent hydrochloric acid, page 678, and distilled water.

Ammonia T.S.—See page 732.

The heavy metals limits of Ammonia T.S. used in this test shall not exceed 2 parts per million, when determined as directed in the monographs for *Liquor Ammonizæ Dilutus*.

Hydrogen Sulfide T.S.—See page 736.

Stock Solution of Lead Nitrate—Dissolve 0.1598 Gm. of lead nitrate in 100 cc. of distilled water to which has been added 1 cc. of nitric acid, then dilute to 1000 cc. with distilled water. This solution must be prepared and stored in glass containers free from soluble lead salts.

Standard Lead Solution—Dilute 10 cc. of the stock solution of lead nitrate, accurately measured, to 100 cc. with distilled water. This solution must be freshly prepared. Each cc. of this standard lead solution contains the equivalent of 0.01 mg. of lead. When 0.1 cc. of standard lead solution is employed to prepare the standard to be compared with a solution of 1 Gm. of the substance being tested, the comparison solution thus prepared contains the equivalent of 1 part of lead per million parts of the substance tested.

Procedure for Testing Chemicals:

Solution A—Introduce into a 50-cc. Nessler tube 2 cc. of diluted acetic acid, and exactly the quantity of standard lead solution containing the lead equivalent of the heavy metals limit specified for the substance to be tested, and make up to 25 cc. with distilled water.

Solution B—This consists of 25 cc. of the solution prepared for this test according to the specific directions in each monograph.

Transfer solutions A and B to similar 50-cc. Nessler tubes, add 10 cc. of hydrogen sulfide T.S. to each tube, mix, allow to stand for 10 minutes, then view downward over a white surface: the color of Solution B is no darker than that of Solution A.

Procedure for Testing Volatile Oils:

Shake 10 cc. of the oil with an equal volume of distilled water to which a drop of hydrochloric acid has been added, and pass hydrogen sulfide through the mixture until it is saturated: no darkening in color is produced in either the oil or the water.

Identification of Chemicals

Under this heading are placed tests which are frequently referred to in the Pharmacopœia. To conserve space they are grouped here and in the text are referred to by title and page.

These tests are to be used for the identification of official chemicals. They are not intended to be applicable to mixtures of substances unless specific directions are given for such use.

Acetate—When warmed with concentrated sulfuric acid, acetates evolve acetic acid. If acetic acid or an acetate is warmed with sulfuric acid and alcohol, the characteristic odor of ethyl acetate is evolved. With neutral solutions of acetates, ferric chloride T.S. produces a deep red color which is destroyed by the addition of mineral acids.

Aluminum—Solutions of aluminum salts yield with ammonia T.S. a gelatinous white precipitate which is insoluble in an excess of ammonium hydroxide. Sodium hydroxide T.S. or sodium sulfide T.S. produces the same precipitate which dissolves in an excess of either of these reagents.

Ammonium—Ammonium salts are decomposed by the addition of an excess of sodium hydroxide T.S., with the evolution of ammonia, recognizable by its odor and by its alkaline effect upon moistened red litmus paper exposed to the gas. Warming the solution accelerates the decomposition.

Antimony—Solutions of antimonous compounds, strongly acidulated with hydrochloric acid, yield with hydrogen sulfide an orange precipitate of antimony sulfide which is insoluble in ammonia T.S., but soluble in ammonium sulfide T.S.

Arsenate—Soluble arsenates yield with silver nitrate T.S. a reddish-brown precipitate which is soluble in diluted nitric acid and in ammonia T.S. Soluble arsenates yield a white precipitate with magnesia mixture T.S. This precipitate is soluble in hydrochloric acid, which solution, when heated, yields with hydrogen sulfide a yellow precipitate, soluble in ammonium sulfide T.S.

Arsenite—Neutral solutions of arsenites yield with silver nitrate T.S. a yellow precipitate. The precipitate is soluble in either ammonia T.S. or in diluted nitric acid. Neutral solutions of arsenites yield with cupric sulfate T.S. a green precipitate. When boiled with sodium hydroxide T.S. the precipitate becomes red in color. Solutions of arsenous salts which have been acidified with hydrochloric acid yield a yellow precipitate with hydrogen sulfide. The precipitate is insoluble in hydrochloric acid, but soluble in ammonium carbonate T.S.

Barium—Solutions of barium salts yield a white precipitate with diluted sulfuric

acid. This precipitate is insoluble in hydrochloric or nitric acid. Barium salts impart a yellowish-green color to a non-luminous flame, appearing blue when viewed through green glass.

Benzoate—In neutral solutions, benzoates yield a salmon-colored precipitate with ferric chloride T.S. In moderately concentrated aqueous solutions, benzoates yield a precipitate of benzoic acid upon acidulation with diluted sulfuric acid. This precipitate is readily soluble in ether.

Bicarbonate—(*See Carbonate*)

Bismuth—When dissolved in a slight excess of nitric or hydrochloric acid, bismuth salts yield a white precipitate upon dilution with water. This precipitate is colored brown by hydrogen sulfide, and the resulting compound dissolves in a warm mixture of equal parts of nitric acid and water.

Bisulfite—(*See Sulfite*)

Borate—Solutions of borates, acidulated with hydrochloric acid, color turmeric paper brownish-red; the color becomes intensified by drying; the color changes to greenish-black by moistening with ammonia T.S. When a borate is treated with sulfuric acid, methyl alcohol added, and the mixture ignited, it burns with a green-bordered flame.

Bromate—Sulfurous acid added drop by drop to a solution of a bromate produces a yellow color, which disappears upon the addition of an excess of sulfurous acid. Bromates, when ignited gently with charcoal, yield bromides which may be recognized by the characteristic reactions.

Bromide—In solutions of bromides, the addition of chlorine T.S., drop by drop, liberates bromine which is dissolved by shaking with chloroform, coloring the chloroform red to reddish-brown. Silver nitrate T.S. produces in solutions of bromides a yellowish precipitate which is insoluble in nitric acid, and slightly soluble in ammonia T.S.

Cadmium—Neutral, alkaline, or moderately acid solutions of cadmium salts yield a yellow precipitate with hydrogen sulfide. This precipitate is insoluble in alkali hydroxides, alkali sulfides, and in cold diluted acids. It is soluble in cold moderately diluted nitric acid, hot diluted hydrochloric acid or hot moderately diluted sulfuric acid.

Calcium—In neutral or alkaline solutions of calcium salts, ammonium oxalate T.S. produces a white precipitate. This precipitate is insoluble in acetic acid, but dissolves in hydrochloric acid. Calcium salts moistened with hydrochloric acid impart a transient yellowish-red color to a non-luminous flame.

Carbonate—Carbonates or bicarbonates effervesce with acids, yielding a colorless gas, which when passed into calcium hydroxide T.S. produces an immediate white precipitate. A cold aqueous solution of a soluble carbonate is colored red by phenolphthalein T.S., while a similar solution of a bicarbonate remains unchanged or is only slightly colored.

Cerium—When a cerium salt is mixed with about two and one half times its weight of lead dioxide, and the mixture boiled with nitric acid, the liquid becomes yellow.

Chlorate—Solutions of chlorates yield no precipitate with silver nitrate T.S. The addition of sulfurous acid to this mixture produces a white precipitate which is insoluble in nitric acid but soluble in ammonia T.S. Upon ignition, chlorates yield chlorides, recognizable by appropriate tests. When concentrated sulfuric acid is added to a dry chlorate, decrepitation occurs and a greenish-yellow gas is

evolved. *Caution*—Only a small amount of chlorate should be used for this test and extreme caution must be exercised in performing it.

Chloride—Solutions of chlorides yield a white, curdy precipitate with silver nitrate T.S., which is insoluble in nitric acid, but dissolves in a slight excess of ammonia T.S. When testing alkaloidal hydrochlorides, the mixture, after the addition of ammonia, is filtered and the filtrate acidified with nitric acid. Solutions of chlorides when warmed with potassium permanganate and diluted sulfuric acid evolve the characteristic odor of chlorine.

Chromate—Solutions of chromates or dichromates, free from mineral acids, yield with lead acetate T.S. a yellow precipitate, which is insoluble in acetic acid. When a chromate or a dichromate is acidulated with diluted sulfuric acid and solution of hydrogen peroxide added, a transient blue color is produced. Upon shaking with ether immediately, the blue color passes into the ethereal layer.

Citrate—To a solution of 5 cc. of a citrate (1 in 10) add 1 cc. of calcium chloride T.S. and 3 drops of bromothymol blue T.S., and slightly acidify with diluted hydrochloric acid. Add tenth-normal sodium hydroxide until the color changes to a clear blue; then boil the solution for 3 minutes, agitating it gently during the heating period: a white, crystalline precipitate appears in the liquid. This precipitate is insoluble in sodium hydroxide T.S., but dissolves in diluted hydrochloric acid.

When to a solution of a citrate, one-tenth its volume of mercuric sulfate T.S. is added, the mixture heated to boiling, then potassium permanganate T.S. added, a white precipitate is produced.

Cobalt—Solutions of cobaltous compounds yield a blue precipitate with sodium hydroxide T.S. This precipitate rapidly changes color, becoming olive-green, but if boiled soon after its formation, it becomes rose-red. Solutions of cobalt salts, when saturated with potassium chloride and treated with potassium nitrite and acetic acid, yield a yellow precipitate.

Copper—Solutions of cupric compounds, acidulated with hydrochloric acid, deposit a red film of metallic copper upon a bright untarnished surface of metallic iron. An excess of ammonia T.S., added to a solution of a cupric salt, produces first a bluish precipitate and then a deep blue-colored solution. With potassium ferrocyanide T.S., solutions of cupric salts yield a red precipitate, insoluble in diluted acids.

Cyanide—To 10 cc. of a dilute solution of a cyanide, add three drops of freshly prepared ferrous sulfate T.S., 1 cc. of sodium hydroxide T.S., a few drops of ferric chloride T.S., warm, and finally acidify with diluted sulfuric acid; a blue precipitate is produced.

Dichromate—(*See Chromate*)

Ferricyanide—Solutions of ferricyanides yield a blue precipitate with ferrous sulfate T.S. This precipitate is insoluble in diluted hydrochloric acid, but is decomposed by sodium hydroxide T.S.

Ferrocyanide—Solutions of ferrocyanides yield a blue precipitate with ferric chloride T.S. With cupric sulfate T.S., ferrocyanides yield a red precipitate insoluble in diluted acids.

Glycerophosphate—Solutions of glycerophosphates yield no precipitate in the cold with ammonium molybdate T.S., but upon prolonged boiling a yellow precipitate is formed. Moderately diluted solutions of glycerophosphates, when treated with calcium chloride T.S., remain unaffected in the cold, but on boiling a precipitate is produced. When a glycerophosphate is mixed with an equal weight of powdered

potassium bisulfate and gently heated in a test tube over a free flame, the very pungent odor of acrolein is evolved.

Gold—Solutions of auric salts produce with sodium hydroxide T.S. a brown precipitate which is soluble in an excess of the reagent. Solutions of auric salts when treated with stannous chloride T.S. and allowed to stand slowly form a purple precipitate.

Hypophosphite—When strongly heated, hypophosphites evolve spontaneously inflammable hydrogen phosphide. Hypophosphites in solution yield a white precipitate with mercuric chloride T.S. This precipitate becomes gray when an excess of hypophosphite is present. Solutions of hypophosphites, acidulated with sulfuric acid and warmed with copper sulfate T.S., yield a red precipitate.

Iodide—Solutions of iodides, upon the addition of chlorine T.S., drop by drop, liberate iodine which colors the solution yellow to red. On shaking with chloroform the latter is colored violet. The iodine thus liberated gives a blue color with starch T.S. Silver nitrate T.S. produces in solutions of iodides a yellow, curdy precipitate which is insoluble in nitric acid and in ammonia T.S.

Iron—Ferrous or ferric compounds in solution yield a black precipitate with ammonium sulfide T.S. This precipitate is dissolved by cold diluted hydrochloric acid with the evolution of hydrogen sulfide.

Ferric Salts—Acid solutions of ferric salts yield a dark blue precipitate with potassium ferrocyanide T.S. With an excess of sodium hydroxide T.S., a reddish-brown precipitate is formed. Solutions of ferric salts produce with ammonium thiocyanate T.S. a deep red color which is not destroyed by diluted mineral acids.

Ferrous Salts—Solutions of ferrous salts yield a dark blue precipitate with potassium ferriocyanide T.S. This precipitate is insoluble in diluted hydrochloric acid, but is decomposed by sodium hydroxide T.S. Solutions of ferrous salts yield with sodium hydroxide T.S. a greenish-white precipitate, the color rapidly changing to green and then to brown on shaking.

Lactate—Solutions of lactates, when acidulated with sulfuric acid, potassium permanganate T.S. added, and the mixture heated, evolve acetaldehyde which is recognizable by its odor.

Lead—Solutions of lead salts yield with diluted sulfuric acid a white precipitate which is insoluble in diluted hydrochloric or nitric acid, but completely soluble in warm sodium hydroxide T.S. and in ammonium acetate solution. With potassium chromate T.S. solutions of lead salts, free or nearly free from mineral acids, yield a yellow precipitate which is insoluble in acetic acid but soluble in sodium hydroxide T.S.

Lithium—Moderately concentrated solutions of lithium salts, made alkaline with sodium hydroxide, yield with sodium carbonate T.S. a white precipitate on boiling. The precipitate is soluble in ammonium chloride T.S. Lithium salts moistened with hydrochloric acid impart an intense crimson color to a non-luminous flame. Solutions of lithium salts are not precipitated by diluted sulfuric acid or soluble sulfates (difference from *strontium*).

Magnesium—Solutions of magnesium salts in the presence of ammonium chloride yield no precipitate with ammonium carbonate T.S., but on the subsequent addition of sodium phosphate T.S. a white crystalline precipitate is produced which is insoluble in ammonia T.S.

Manganese—Solutions of manganous salts yield a salmon-colored precipitate with ammonium sulfide T.S. This precipitate is dissolved by acetic acid.

Mercury—Solutions of mercury salts free from excess of nitric acid, when applied to bright copper foil, yield a deposit, which, upon rubbing, becomes bright and silvery in appearance. With hydrogen sulfide, solutions of mercury compounds yield a black precipitate which is insoluble in ammonium sulfide T.S., or in boiling diluted nitric acid.

Mercuric Salts—Solutions of mercuric salts yield a yellow precipitate with sodium hydroxide T.S. They yield also, in neutral solutions, a scarlet precipitate with potassium iodide T.S. very soluble in an excess of the reagent.

Mercurous Salts—Mercurous compounds are decomposed, producing a black color, by sodium hydroxide T.S. Solutions of mercurous salts yield with hydrochloric acid a white precipitate which is blackened by ammonia T.S. With potassium iodide T.S., a yellow precipitate is produced which may become green upon standing.

Molybdate—When a dry molybdenum compound is covered with sulfuric acid and heated until the acid is almost completely removed a blue residue remains. Solutions of molybdates acidulated with nitric acid, yield a yellow precipitate on warming with a small amount of sodium phosphate T.S. This precipitate is soluble in aqueous sodium hydroxide solutions and in ammonia T.S.

Nitrate—When a solution of a nitrate is mixed with an equal volume of sulfuric acid, the mixture cooled, and a solution of ferrous sulfate superimposed, a brown color is produced at the junction of the two liquids. When a nitrate is heated with sulfuric acid and metallic copper, brownish-red fumes are evolved. Nitrates do not decolorize acidified potassium permanganate T.S. (difference from *nitrites*).

Nitrite—When treated with diluted mineral acids or with acetic acid, nitrites yield brownish-red fumes. On adding a few drops of potassium iodide T.S. and a few drops of diluted sulfuric acid to a solution of a nitrite, iodine is liberated which colors starch T.S. blue.

Nitroferricyanide (Nitroprusside)—The addition of a dilute solution of a soluble sulfide to a solution of a nitroprusside produces a transient purple to deep violet color, the intensity and shade of color depend upon the concentration of the solutions.

Oxalate—Neutral or alkaline solutions of oxalates yield a white precipitate with calcium chloride T.S. This precipitate is insoluble in acetic acid but is dissolved by hydrochloric acid. Hot acidified solutions of oxalates decolorize potassium permanganate T.S.

Palladium—Solutions of palladous salts yield with ammonia T.S. a salmon-colored precipitate which is soluble in an excess of the reagent. Hydrochloric acid added to this solution produces a yellow precipitate. Solutions of palladous salts yield with potassium iodide T.S. a black precipitate.

Permanganate—Solutions of permanganates acidulated with sulfuric acid are decolorized by solution of hydrogen peroxide and by sodium bisulfite T.S., in the cold, or by oxalic acid T.S. in hot solution.

Peroxide—Solutions of peroxides slightly acidulated with sulfuric acid yield a deep blue color upon the addition of potassium dichromate T.S. On shaking the mixture with an equal volume of ether and allowing the liquids to separate, the blue color will be found in the superimposed ethereal layer.

Phosphate—Neutral solutions of orthophosphates yield with silver nitrate T.S. a yellow precipitate, which is soluble in diluted nitric acid or in ammonia T.S. With ammonium molybdate T.S., a yellow precipitate is produced which is soluble in ammonia T.S.

Phosphotungstate—(See *Tungstate*)

Potassium—Potassium compounds impart a violet color to a non-luminous flame, but the presence of small quantities of sodium masks the color. In neutral, concentrated or moderately concentrated solutions of potassium salts (depending upon the solubility and the potassium content of the salt), sodium bitartrate T.S. produces a white crystalline precipitate which is soluble in ammonia T.S., alkali hydroxides or carbonates. The formation of the precipitate, which is usually slow, is accelerated by stirring or rubbing the inside of the test tube with a glass rod. The addition of a little glacial acetic acid or alcohol also promotes the formation of the precipitate.

Salicylate—In moderately dilute solutions of salicylates, ferric chloride T.S. produces a violet color. The addition of acids to moderately concentrated solutions of salicylates produces a white crystalline precipitate of salicylic acid.

Selenate—Solutions of selenates yield with stannous chloride T.S. a red precipitate which redissolves upon boiling.

Selenite—Solutions of selenites yield a red precipitate with sodium bisulfite T.S.

Silver—Solutions of silver salts yield with hydrochloric acid a white, curdy precipitate, which is insoluble in nitric acid but is easily soluble in ammonia T.S. To a solution of a silver salt add ammonia T.S. and a small quantity of solution of formaldehyde; upon warming, a mirror of metallic silver is deposited upon the sides of the test tube.

Sodium—Sodium compounds after conversion to chloride or nitrate yield with cobalt-uranyl acetate T.S. a golden-yellow precipitate, which forms after several minutes' agitation. Sodium compounds impart an intense yellow color to a non-luminous flame.

Strontium—Calcium sulfate T.S. produces a white precipitate with solutions of strontium salts. Strontium compounds, moistened with hydrochloric acid, impart a crimson color to a non-luminous flame.

Sulfate—Solutions of sulfates yield with barium chloride T.S. a white precipitate, which is insoluble in hydrochloric or nitric acid. With lead acetate T.S. sulfates yield a white precipitate soluble in ammonium acetate solution. Hydrochloric acid produces no precipitate when added to solutions of sulfates (difference from *thiosulfates*).

Sulfide—When treated with an acid, many sulfides yield hydrogen sulfide, recognizable by its characteristic, pungent odor.

Sulfite—When treated with hydrochloric acid, sulfites and bisulfites yield colorless sulfur dioxide, recognizable by its pungent odor which is the same as the odor of burning sulfur. This gas blackens filter paper moistened with mercurous nitrate T.S.

Tartrate—With neutral solutions of tartrates, silver nitrate T.S. produces a white precipitate. Upon dissolving this precipitate in just sufficient ammonia T.S. and warming, metallic silver is deposited on the side of the test tube, forming a mirror. On adding to an aqueous solution of tartaric acid or of a tartrate, acidified with a few drops of acetic acid, a drop of ferrous sulfate T.S., then a few drops of hydrogen peroxide T.S. and finally an excess of sodium hydroxide T.S., a purplish violet color is produced.

Thiocyanate—Solutions of thiocyanates yield a red color with ferric chloride T.S. which is not destroyed by moderately concentrated mineral acids.

Thiosulfate—Solutions of thiosulfates yield with hydrochloric acid a white precipitate which soon turns yellow, sulfur dioxide is liberated, recognizable by its odor. The addition of ferric chloride T.S. to solutions of thiosulfates, produces a dark violet color which quickly disappears.

Tin—When metallic zinc is placed in a solution of a salt of tin acidified with hydrochloric acid, the tin is precipitated in metallic form. When dissolved in hydrochloric acid, tin produces a white or gray precipitate with mercury bichloride T.S.

Stannic—Solutions of stannic compounds yield with hydrogen sulfide a yellow precipitate, insoluble in diluted hydrochloric acid but soluble in colorless solutions of alkali sulfides.

Stannous—Solutions of stannous salts yield with mercury bichloride T.S. a white or gray precipitate, and with hydrogen sulfide, a brownish black precipitate.

Tungstate—Solutions of tungstates or phosphotungstates yield with stannous chloride T.S. a yellow precipitate, which, upon heating with hydrochloric acid, changes to blue. Solutions of tungstates, when evaporated to dryness with hydrochloric acid, leave a yellow residue which is soluble in ammonia T.S.

Vanadate—Solutions of vanadates yield with ammonium sulfide T.S. a brown precipitate, moderately soluble in an excess of the reagent to produce a reddish-brown solution.

Zinc—In the presence of sodium acetate, zinc salts yield a white precipitate with hydrogen sulfide. This precipitate is insoluble in acetic acid but is dissolved by diluted hydrochloric acid. Ammonium sulfide produces a similar precipitate in neutral or alkaline solutions. Zinc salts in solution yield with potassium ferrocyanide T.S. a white precipitate which is insoluble in diluted hydrochloric acid.

Lead Limit for Reduced Iron

All chemicals used in this test should be as lead-free as obtainable, and all glassware should be rinsed with warm, 50 per cent nitric acid followed by distilled water.

Reagents

Dithizone Solution A—Dissolve 30 mg. of dithizone in 1000 cc. of chloroform.

Dithizone Solution B—Dissolve 12 mg. of dithizone in 1000 cc. of chloroform.

Nitric Acid Solution—Dilute 1 cc. of reagent nitric acid with distilled water to make 100 cc.

Lead Solution—Dilute exactly 1 cc. of standard lead solution, page 586, (containing 10 micrograms of lead in each cc.) with sufficient nitric acid solution to make 10 cc. This solution contains 1 microgram of lead in each cc.

Ammonium Citrate Solution—Dissolve 40 Gm. of ammonium citrate in sufficient distilled water to make approximately 90 cc. Add 2 drops of phenol red T.S., render slightly alkaline by the addition of ammonia T.S., and dilute to 100 cc. with distilled water. Remove the lead from this solution by shaking it in a separator with 75-cc. portions of dithizone solution A until the original color of the dithizone remains unchanged.

Potassium Cyanide Solution—Dissolve 50 Gm. of potassium cyanide in sufficient distilled water to make 100 cc. Remove the lead from this solution by extraction

with successive portions of dithizone solution A as directed under *ammonium citrate solution* and finally wash with chloroform. Dilute the solution with sufficient distilled water so that each 100 cc. will contain 10 Gm. of potassium cyanide.

Hydroxylamine Hydrochloride Solution—Dissolve 20 Gm. of hydroxylamine hydrochloride in sufficient distilled water to make approximately 65 cc. Transfer to a separator, add a few drops of thymol blue pH indicator, add ammonia T.S. until the solution assumes a yellow color, then add 10 cc. of a 4 per cent aqueous solution of sodium diethyldithiocarbamate, mix and allow to stand for 5 minutes. Extract the mixture by shaking with chloroform and repeat the extraction with chloroform until a portion of the chloroform extract does not assume a yellow color when shaken with a dilute solution of cupric sulfate. Add diluted hydrochloric acid to the solution until the solution is pink to thymol blue pH indicator and then dilute to 100 cc. with distilled water.

Ammonia-cyanide Solution—Dissolve 2 Gm. of potassium cyanide in 15 cc. of stronger ammonia T.S. and dilute to 100 cc. with distilled water.

The Test—

Add slowly 10 cc. of nitrohydrochloric acid to 1 Gm. of reduced iron and evaporate to dryness on a steam bath. Dissolve the residue in 4 cc. of hydrochloric acid and 20 cc. of distilled water, and filter the solution into a 100-cc. volumetric flask. Rinse the filter several times with hot distilled water combining the filtrates with the original filtrate. Cool the combined filtrates to room temperature and dilute to 100 cc. with distilled water and mix thoroughly.

Transfer exactly 10 cc. of this solution to a separator and add, in the following order, 6 cc. of ammonium citrate solution, 2 cc. of potassium cyanide solution, and 2 cc. of hydroxylamine hydrochloride solution. Add 2 drops of phenol red T.S., render alkaline by the addition of ammonia T.S., and then add 5 cc. of dithizone solution A, shake well and allow to separate. Transfer the chloroform layer to another separator and repeat the extraction of the aqueous portion with 5-cc. portions of the dithizone solution A until no change in color is observed in the chloroform solution. Discard the aqueous layer. Shake the combined chloroform extracts for 30 seconds with 20 cc. of nitric acid solution and discard the chloroform layer. Add to the acid portion exactly 5 cc. of dithizone solution B and 4 cc. of ammonia-cyanide solution, and shake for 30 seconds. The color of the chloroform layer is no deeper shade of violet than that of a similar chloroform extract obtained from a solution containing 5 cc. of the *lead solution*, diluted to 10 cc. with distilled water, and treated in exactly the same manner as the solution being tested. The lead limit of Reduced Iron is 50 parts per million.

Should the color developed in the dithizone layer by the sample solution be pink, an amount of lead in excess of the control is indicated and a smaller aliquot should be taken and the test repeated, if desirable, to ascertain the quantity of lead present.

Medicine Dropper, Official

The official medicine dropper shall have its delivery end 3 millimeters in external diameter, and be adjusted to deliver 20 drops of distilled water, weighing 1 Gm., at a temperature of 15° C. A tolerance of 10 per cent below or 10 per cent above the delivery specifications is permitted.

Melting Points

For the purpose of the Pharmacopœia the melting points or ranges of solids are defined as those points or ranges of temperature at which or within which they are observed to melt when treated as directed in the following tests:

For the determination of their melting points, Pharmacopœial solids are divided into three classes:

CLASS I—Materials readily reduced to a powder.

CLASS II—Materials not readily reduced to a powder, such as fats, fatty acids, paraffin, and waxes.

CLASS III—Petrolatum.

Apparatus Required (*see illustration*):

1. A *round-bottom glass tube* of from 30 mm. to 40 mm. internal diameter and about 10 cm. long, flaring slightly at the top like an ordinary test tube. The walls of the tube are not more than 1.5 mm. thick at any point. The tube is made of glass which will withstand heating over an open Bunsen flame.

2. A stirring device, which may be made from a glass rod of about 2 mm. external diameter. It is made circular at the end to fit the container (1) and is bent twice at right angles above the top of the container to bring its outer end within reach for convenient manipulation.

Any other melting point apparatus or method, capable of equal accuracy, may be used.

3. A *standard thermometer* of Type I or Type II, page 622, covering the desired range of temperature.

4. An auxiliary thermometer of Type I (page 622).

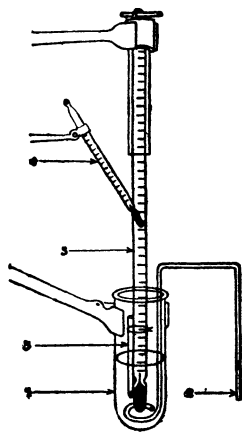
5. A capillary glass tube about 6 cm. long and from 0.8 to 1.2 mm. internal diameter, the walls from 0.2 to 0.3 mm. thick and the tube closed at one end.

Procedure for testing materials of Class I: Reduce the sample to a very fine powder, and, unless otherwise directed, render it anhydrous when it contains water of hydration by drying it at the temperature specified in the text, or, when the substance contains no water of hydration, by drying it for 24 hours over sulfuric acid.

Select a bath suitable for the melting temperature to be determined, and fill the container to a depth which will permit of such immersion of the thermometer that the upper end of the bulb will be from 2 to 3 cm. below the surface of the bath and the lower end of the bulb about equally distant from the bottom of the container.

Charge the capillary glass tube with sufficient of the dry powder to form a column in the bottom of the tube from 2.5 to 3.5 mm. high when packed down as closely as possible by moderate tapping on a solid surface. Attach the capillary tube to the thermometer by wetting both with the liquid of the bath or by means of a piece of platinum wire and adjust its height so that the material in the capillary is beside the thermometer bulb.

Attach the auxiliary thermometer, as shown in the illustration, so that the center of its bulb is as close as possible to the stem of the main thermometer at a point mid-



Apparatus for Taking
Melting Points

way between the surface of the bath and the graduation for the supposed melting point. In order to prevent the heat from the burner or currents of cold air from affecting the temperature of the auxiliary thermometer, it is advisable to adjust to the stem of the main thermometer a movable platform made of stiff paper, having its edges folded so as to form a box-like shield surrounding the bulb of the auxiliary thermometer.

Heat the bath by means of a free Bunsen flame until a temperature 30 degrees below the supposed melting point is reached, then carefully regulate the rate of rise in temperature to about 3 degrees per minute until the material begins to melt (the temperature at which the column of the sample is observed to collapse definitely against the side of the tube at any point is defined as the beginning of melting), and from that time carefully regulate the rise in temperature to about one-half degree per minute until the melting is complete. (The temperature at which the material becomes liquid throughout is defined as the end of melting.) The bath must be stirred constantly throughout the heating. Unless otherwise directed, the bath may be preheated to a temperature 30° below the supposed melting point before attaching the capillary.

The result thus obtained as the melting interval must be adjusted by applying the calibration correction and that for the emergent stem, as follows:

Note the temperature registered by the auxiliary thermometer at the end of the melting of the substance and calculate the emergent stem correction by the following formula:

$$\text{correction} = 0.00015 \times N(T - t)$$

in which the N represents the number of degrees of emergent stem from the bath, T the temperature at the end of melting, and t the temperature registered by the auxiliary thermometer; the correction to be added to the observed reading of the main thermometer.

To avoid the necessity of determining the emergent stem correction each time a melting point is taken, the correction for intervals of 10 degrees may be determined (at a room temperature of about 25° C.) and the results plotted on graph paper, the temperatures of the bath being represented by the abscissæ and the corrections by the ordinates. The correction for any intermediate temperature can then be interpolated.

NOTE—Suggestions regarding liquids to be used for baths in testing materials belonging to Class I:

For temperatures up to 200° C., a purified, concentrated sulfuric acid is a suitable bath. For higher temperatures, up to about 350° C., a pure grade of cottonseed oil (almost colorless) will serve for a limited number of determinations. Other, though less desirable, substitutes for sulfuric acid for use at high temperatures are: (1) a pure grade of paraffin which has been freshly distilled; (2) clean, white, hydrogenated vegetable oil. A very satisfactory bath is prepared by cautiously boiling together, for from 5 to 10 minutes under a hood, a mixture of 70 parts of sulfuric acid and 30 parts of potassium sulfate, stirring constantly until the potassium sulfate is completely dissolved.

Procedure for Testing Materials of Class II: Carefully melt the material to be tested at as low a temperature as possible and draw it into a capillary tube, which is open at both ends, to a depth of about 10 mm. Cool the charged tube at 10° C., or

lower, for 24 hours, or in contact with ice for at least 2 hours. Then attach the tube to a standard thermometer by means of a rubber band, adjust and heat it in a water bath, as directed under procedure for testing materials in Class I, except that, within 5 degrees of the assumed melting temperature, the rate of rise of temperature is carefully regulated to about one-half degree per minute.

The temperature at which the material is observed to rise in the capillary tube is taken as the melting point.

Procedure for Testing Materials of Class III: Melt the sample slowly, while stirring, until it reaches a temperature of 90° to 92° C. Remove the source of the heat and allow the molten substance to cool to a temperature of 8° to 10° C. above the expected melting point. Chill the bulb of a thermometer, Type III, page 622, to 5° C., wipe it dry, and while still cold thrust it into the molten substance so that approximately the lower half of the bulb is submerged. Withdraw it immediately and hold it vertically away from the heat until the wax surface dulls, then dip it for 5 minutes into a water bath having a temperature not greater than 16° C.

Fix the thermometer securely in a test tube by means of a cork so that the lowest point is 15 mm. above the bottom of the test tube. Suspend the test tube in water in a beaker at a temperature of about 16° C., and raise the temperature of the bath to 30° C. at the rate of 3° per minute, then at a rate of 2° per minute until the first drop leaves the thermometer. The temperature at which the first drop leaves the thermometer is the melting point. Use a freshly melted portion of the sample for each determination. If the variation of three determinations is less than 1° C., take the average of the three. If the variation of three determinations is greater than 1° C., make two additional determinations and take the average of the five.

Nitrite Assay

Apparatus—Fit a 300-cc. Erlenmeyer flask with a 2-hole rubber stopper. Through one hole pass an aeration tube leading to the bottom of the flask and tapered to an internal diameter of about 1 mm. at the lower end. Through the other hole pass a glass tube, of at least 6 mm. internal diameter, which will extend about 1 cm. above and below the stopper. Connect the aeration tube with a cylinder or generator of air-free carbon dioxide.

Method—Place 10 Gm. of potassium iodide in the flask and add 40 cc. of boiling, deaerated distilled water. Insert the stopper in the flask and pass a stream of carbon dioxide through the flask at a rate of 5 bubbles per second until the solution has cooled to room temperature. Add 10 cc. of dilute hydrochloric acid (1 in 2) through the outlet tube, and continue the stream of carbon dioxide for at least 5 minutes. If any iodine is liberated, as shown by the appearance of a yellow color, cautiously add tenth-normal sodium thiosulfate from a burette, through the outlet tube, until the color is just discharged.

Add the directed volume of the nitrite solution with a transfer pipette, passing the pipette through the outlet tube until the tip is just above the surface of the potassium iodide solution. Touch the tip of the pipette to the outlet tube to remove adhering nitrite solution, then rinse the outlet tube with a fine jet of aldehyde-free alcohol from a wash bottle. At once titrate the liberated iodine with tenth-normal sodium thiosulfate, introducing the tip of the burette through the outlet tube.

*One cubic centimeter of Tenth-Normal Sodium Thiosulfate
is the equivalent of:*

Amyl Nitrite, $C_5H_{11}ONO$	0.01172 Gm.
Glyceryl Trinitrate, $C_3H_5(NO_3)_3$	0.0113 Gm.

Caution—When assaying amyl nitrite, the alcoholic solution of the nitrite must be used within 30 minutes after its preparation. If more time has elapsed, a fresh solution must be made.

Nitrogen (Total) by the Kjeldahl Method (Method I)

Nitrates and Nitrites Absent—Place about 1 Gm. of the substance, accurately weighed, in a 500-cc. Kjeldahl flask of hard glass. The material to be tested, if solid or semi-solid, may be wrapped in a sheet of nitrogen-free filter paper for convenience in transferring it to the flask. Add 10 Gm. of powdered potassium sulfate or anhydrous sodium sulfate, 0.5 Gm. of powdered cupric sulfate, and 20 cc. of sulfuric acid. Incline the flask at an angle of about 45° and gently heat the mixture, keeping the temperature below the boiling point of the mixture until frothing has ceased. Increase the heat until the acid boils briskly, and continue the heating until the solution has been clear green in color for 30 minutes. Allow the mixture to cool, add 150 cc. of distilled water, thoroughly mix the contents of the flask, and cool again. Add cautiously 100 cc. of a 30-per cent aqueous solution of sodium hydroxide, added so as to cause the solution to flow down the inner side of the flask to form a layer under the acid solution. Add a few pieces of granulated zinc, connect the flask, by means of a Kjeldahl connecting bulb, with a condenser, the delivery tube from which dips beneath the surface of a mixture of 30 cc. of half-normal hydrochloric or sulfuric acid and 25 cc. of distilled water contained in an Erlenmeyer flask or a wide-mouth bottle of about 500-cc. capacity. Mix the contents of the Kjeldahl flask by gentle rotation, and distil until about two-thirds of the contents of the flask has distilled over. Add about 5 drops of methyl red T.S. to the contents of the receiving flask and determine the excess of acid by titration with half-normal sodium hydroxide. Run a blank test and make necessary corrections. Each cc. of half-normal acid consumed is equivalent to 0.007004 Gm. of nitrogen.

When the nitrogen content of the substance is known to be low, the half-normal hydrochloric or sulfuric acid may be replaced by tenth-normal acid and tenth-normal alkali should then be used in titrating the excess of acid. One cc. of tenth-normal hydrochloric or sulfuric acid is equivalent to 0.0014008 Gm. of nitrogen.

With Nitrates Present—Place a quantity of the substance, accurately weighed, corresponding to about 0.15 Gm. of nitrogen, in a 500-cc. Kjeldahl flask of hard glass, and add thereto 25 cc. of sulfuric acid in which 1 Gm. of salicylic acid has previously been dissolved. Mix the contents of the flask thoroughly, and allow the mixture to stand for 30 minutes with frequent shaking. Add to the mixture 5 Gm. of powdered sodium thiosulfate and again mix thoroughly, then add 0.5 Gm. of powdered cupric sulfate and proceed as directed previously for *Nitrates and Nitrites Absent*, beginning with "Incline the flask at an angle of about 45° ."

When the nitrogen content of the substance is known to exceed 10 per cent, from 0.5 to 1.0 Gm. of benzoic acid may be added, prior to digestion, to facilitate the decomposition of the substance.

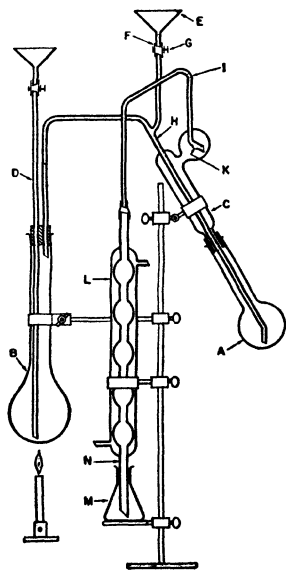
NOTE—There are certain alkaloids and other nitrogen-containing organic compounds that will not yield all of their nitrogen to digestion with sulfuric acid, and this method, therefore, cannot be used for the determination of nitrogen in all organic compounds.

Nitrogen (Total) by the Semi-Micro Kjeldahl Method (Method II)

Apparatus—The apparatus (see illustration) should be constructed throughout of glass of the resistance type. The digestion and distillation flask (*A*) is a 200-cc. round-bottom boiling flask, with a neck approximately 120 mm. long. The steam generator (*B*) is a 1000-cc. Kjeldahl flask. The distillation head (*C*) serves as a spray trap and as a means for the introduction of alkali and of steam into flask *A*. The tube (*D*), which is fitted with a funnel at its top, serves as a safety valve for the flask *B* and allows replenishment of the supply of water. The funnel (*E*) is attached by rubber tubing (*F*), closed by the pinch cock (*G*), to the steam tube (*H*), and permits the addition of alkali to flask *A*. The delivery tube (*I*) is pierced with a hole at the point *K* to avoid clogging by condensate. The condenser (*L*) has a jacket 30 to 40 cm. long and is so arranged that the bottom of the condensing tube (*N*) dips beneath the surface of the solution in the absorption flask (*M*), which has a capacity of 250 to 300 cc. The end of the condensing tube is beveled. When the distillation apparatus is permanently assembled, the distillation head with its accessory tubes may be lagged with a paste of asbestos and magnesia. The flask (*A*) may also be shielded from the air by cloth or asbestos paper during the distillation.

The rubber stopper used for attaching the digestion flask to the distillation apparatus should be lubricated with glycerin. All rubber used in the apparatus should be boiled for 10 minutes in approximately normal sodium hydroxide and thoroughly washed with distilled water before its first use.

The steam generator (*B*) is filled with distilled water to which has been added a few drops of sulfuric acid. Fragments of pumice stone should be placed in the generator to prevent bumping. Other anti-bumping devices may be employed if desired. The apparatus should be steamed out, with the digestion flask (*A*) containing 30 cc. of an aqueous solution of sodium hydroxide (4 in 10), before beginning a series of analyses. Place in the absorption flask (*M*) 15 cc. of an aqueous solution of boric acid (1 in 25), 3 drops of methyl red T.S., and sufficient distilled water to cover the open end of the condensing tube (*N*). Collect from 80 to 100 cc. of distillate, and titrate with hundredth-normal sulfuric acid to obtain the correction factor to be applied to each test.



Semi-micro Kjeldahl Apparatus

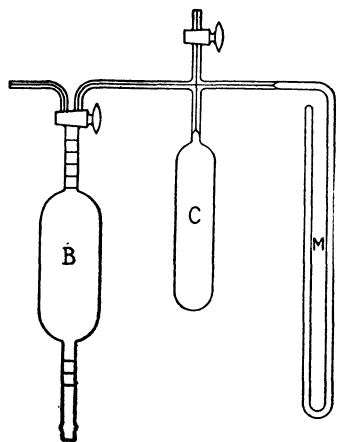
The absorption flasks should be reserved for this purpose, and after use should be thoroughly rinsed with distilled water, stoppered tightly, and set aside to await subsequent use.

Method—Place in the digestion flask (*A*) an accurately weighed or measured quantity of the material, using a quantity thought to contain from 2 to 3 mg. of nitrogen. Add 1 Gm. of a powdered mixture of 10 parts of potassium sulfate and 1 part of cupric sulfate, finally wash down any adhering material from the neck of the flask with a fine jet of distilled water. Add 7 cc. of sulfuric acid, allowing it to rinse down the wall of the flask, then, while swirling the flask, add 1 cc. of 30 per cent hydrogen peroxide, adding it cautiously down the side of the flask.

Heat the flask over a free flame or an electric heater until the solution has a clear blue color and the sides of the flask are free from carbonaceous material. (Do not add hydrogen peroxide during the digestion.) Cautiously add to the digestion mixture 20 cc. of distilled water, cool the solution, and connect the flask to the distillation apparatus. Add through the funnel (*E*) 30 cc. of an aqueous solution of sodium hydroxide (4 in 10), rinse the funnel with 10 cc. of distilled water, tightly close clamp (*G*), and begin the distillation with steam at once. Receive the distillate in 15 cc. of an aqueous solution of boric acid (1 in 25), to which has been added 3 drops of methyl red T.S., and sufficient distilled water to cover the end of the condensing tube. Continue the distillation until the distillate measures from 80 to 100 cc. Remove the absorption flask, rinsing the end of the condensing tube with a small quantity of distilled water, and titrate the distillate with hundredth-normal sulfuric acid.

NOTE—If a quantity of material containing greater amounts of nitrogen is taken, fiftieth-normal or tenth-normal sulfuric acid may be employed in the titration, using such a normality of acid that at least 15 cc. will be required for the titration.

If the total dry weight of material taken is greater than 0.1 Gm., the quantities of sulfuric acid and of sodium hydroxide should be increased proportionately.



Nitrous Oxide Assay Apparatus

Nitrous Oxide Assay Apparatus

The gas burette, "B," consists of a bulb with a lower stem and an upper stem, sealed to a two-way capillary stopcock. Each stem has an internal diameter of 8 mm., and is graduated in tenths of a cc. The length of the upper stem is chosen so that the graduated volume is over 5 cc. For convenience the graduations are marked on the basis of 100 at the stopcock and thence downward to 99, 98, etc. On the lower stem a calibration point is located so that the volume included between that point and the stopcock is 100 cc. This point is marked 100 and through a range of 1 cc. above and below it the stem is gradu-

ated in tenths of a cc. For convenience, the major graduations, proceeding downward, are marked 99, 100, and 101. A levelling bulb is connected by means of rubber pressure tubing to the lower stem.

One arm of the capillary stopcock is sealed directly into one arm of the vertical four-way juncture consisting of capillary tubing. The downward arm of the four-way juncture is sealed to the condensation bulb, "C," the stem of which consists of tubing of 5-mm. internal diameter. The capacity of the bulb, up to the capillary tubing (approximately 60 cc.), is accurately determined. The right-hand arm of the four-way juncture is sealed to a mercury manometer, "M," made of glass tubing of 5-mm. internal diameter. The manometer is equipped with a scale graduated in mm. The upper arm of the four-way juncture is sealed to a capillary stopcock, which provides the only direct connection of the system with the atmosphere. This stopcock and also the burette stopcock must be of the best grade for high vacuum work. A pint Dewar jar is used for the liquid nitrogen bath into which the condensation bulb is to be immersed and it is arranged so that it may be conveniently raised and lowered or removed entirely from the bulb.

Optical Rotation

In a ray of *ordinary light* the vibrations are transverse, that is, they take place in a plane at right angles to the direction of propagation, but the vibration direction is constantly changing. In a ray of *plane polarized light*, commonly designated as *polarized light*, the vibrations are also transverse, but they take place in only one direction.

Polarized light is used in the polarizing microscope and the polariscope, frequently termed a polarimeter. The type of polariscope that is used for determining the percentage of sucrose in solution is called a saccharimeter. These instruments are very serviceable in the determination of the optical properties of solid and liquid substances, the polarizing microscope being used more often for testing solid substances, while the polariscope is primarily adapted for liquids. The polariscope is primarily employed to study liquids, or solutions of solid substances, that rotate the plane of polarization. Such substances are called optically active. If the rotation of the plane of polarization is to the right (as viewed in the direction of propagation) the substance is designated as *dextrorotatory*, and to the left as *levorotatory*.

The extent of the optical activity of any substance is measured in degrees of rotation, and the instrument used for the determination is generally called a polariscope. The determination of the angle of rotation and the character of rotation, that is, to the right or left, is of importance in ascertaining the identity or purity of the material under consideration. Among the materials recognized in the Pharmacopœia there are a number, particularly certain volatile oils and related bodies, for which the determination of the optical activity is of great importance. In some cases the proof of optical inactivity is also very significant.

The property of optical activity is inherently related to the chemical constitution of the substance possessing the property. A knowledge of the extent and character of the optical activity of a specimen may constitute important evidence as to its purity or its concentration in a solution, the other components of which are optically inactive.

Polarimeters are so designed that the angle of rotation may be read to a fraction of a degree. Saccharimeters are provided with a scale that permits the percentage of sucrose in solution to be read directly. The field of vision in these instruments is

of the *penumbral* or *half-shadow* type, that is, the halves of the field may be unequally illuminated, the reading being taken at the point of equal shadow.

Polarimeters and saccharimeters should be used in a dark room, and the determinations made with monochromatic light, unless otherwise directed. There are many methods and devices for the production of monochromatic light, but one of the simplest methods is to introduce into the non-luminous flame of a Bunsen burner a small quantity of sodium chloride on a loop of platinum wire. A monochromatic light of more definite characteristics may be obtained by means of a sodium vapor lamp. The monochromatic light thus obtained corresponds to the D line of the solar spectrum.

The following factors are employed for converting readings of a saccharimeter into angular degree readings of a polarimeter:

1° Laurent (French sugar scale) equals 0.2167° angular rotation D.

1° Ventzke sugar scale equals 0.3468° angular rotation D.

The Ventzke sugar scale is employed upon the Schmidt and Hänsch, Peters and Fric saccharimeters. The French sugar scale is employed upon the Laurent-Jobin and Duboscq-Pellin saccharimeters.

The scale reading for any optically active liquid is directly proportional to the length of the transmitting column of liquid; hence it is essential that the length of the tube employed in any test be known. The choice of tube length is influenced by the intensity of color of the test specimen as well as by the extent of optical activity of the specimen.

The specific rotation of a liquid is defined as the angular rotation in degrees through which the plane of polarization of polarized monochromatic (D) light is rotated by passage through 1 decimeter of the liquid, calculated to the basis of a specific gravity of 1. In case of a solution of an optically active substance the angular rotation is further calculated to the basis of a concentration of 1 Gm. of solute in 1 cc. of solution.

The temperature at which the rotatory activity of a liquid is observed must be designated for the reason that both the specific gravity and the degree of rotatory effect of the liquid vary considerably with temperature.

The specific rotation of an optically active substance is usually expressed by the term $[\alpha]_D^t$ which indicates both the temperature and the kind of light used and so stated expresses a characteristic constant for the substance. In this term the letter *t* represents the numerical designation of the centigrade temperature at which the Specific Rotation was determined, while the letter *D* indicates that sodium light is used. The absence of any indication of the wave length of the light means that white light is to be used. The temperature at which determinations are to be made for this Pharmacopœia is 25° C., except where otherwise indicated. By international agreement, 20° C. has been adopted as the standard temperature at which to take all saccharimeter readings and is likewise the temperature most often presumed in arranging tabulations of Specific Rotatory Power of Liquids and Solids.

It is customary to indicate the character of the rotation by placing a plus sign (+) or a minus sign (−) before the number indicating the angular rotation, as +20°, meaning 20° to the right or −8°, meaning 8° to the left.

For calculating the specific rotatory power of an optically active liquid substance, or solution of an optically active solid, the following formulas are of general application:

$$\text{I. For liquid substances } [\alpha]_D^t = \frac{a}{ld} \qquad \text{II. For solutions } [\alpha]_D^t = \frac{100a}{lpd}$$

$$\text{or } [\alpha]_D^t = \frac{100a}{lc}$$

For calculating the specific rotation $[\alpha]$ using these formulas, the determination of the following factors is necessary:

- a = observed rotation in degrees of the liquid at a temperature t using a sodium light.
- l = the length of the tube in decimeters.
- d = the specific gravity of the liquid or solution at the temperature of observation.
- p = concentration of solution expressed as the number of grams of active substance in 100 grams of solution.
- c = concentration of solution expressed as the number of grams of active substance in 100 cc. of solution.

Proximate Assays

Most alkaloids are practically insoluble in water, but they are soluble in certain organic solvents which are immiscible with water, such as chloroform, ether, amyl alcohol, benzene, etc., or mixtures of these. The salts of the alkaloids, however, are usually soluble in water, but in most cases insoluble in nearly all of the organic solvents. The process of assay by immiscible solvents, which is generally known as the "shaking out" process, is based on this property of alkaloids. It is carried out by treating the drug, or a concentrated liquid extract of it, with a solvent immiscible with water, in the presence of an excess of alkali which liberates the alkaloid. The free alkaloid is dissolved by the immiscible solvent from which it is removed by means of an excess of dilute acid. The acid solutions are then extracted with an immiscible solvent in the presence of an excess of alkali, and the immiscible solvent evaporated to obtain the alkaloid which is either weighed or titrated with standard acid.

Preparation of the Drug for Assay—The drug to be extracted should be ground to a powder of the fineness designated. The definition of powders will be found on page 583. Care should be taken to avoid the loss of water during the powdering of the drug. If it is impossible to avoid this loss, the drug should be dried at a low temperature before powdering, the loss of water noted, and a correction made in the final calculations.

Weighing for Assay—In weighing bulky, crude drugs for the assay an accuracy to within 10 mg. for quantities of 5 Gm. and over is sufficient. Portions of pilular extracts or ointments may be weighed on a piece of waxed or parchmented paper, the surplus paper cut away, and the paper with the sample dropped into the vessel containing the solvent. In transferring weighed portions to a separator, the vessel containing the material to be assayed should be thoroughly rinsed and the rinsings added to the separator.

Extraction of Drugs—The alkaloidal content of alkaloid-bearing drugs is usually extracted by one of the following methods:

A. Maceration—An accurately weighed portion of the ground drug is treated with the specified solvent or mixture of solvents, made alkaline with ammonia T.S., and thoroughly mixed. It is then allowed to macerate for 12 to 24 hours with oc-

casional agitation, or for a shorter period with continuous agitation. At the end of this period, the drug is allowed to settle, an aliquot of the solvent decanted, and treated as described for the purification of the alkaloids.

B. Percolation—An accurately weighed quantity of the ground drug is placed in a suitable container and completely saturated with the specified solvent or mixture of solvents, and allowed to stand for 5 minutes. A quantity of ammonia T.S. sufficient to make the mixture distinctly alkaline is added and thoroughly mixed with the drug. The mixture is then transferred to a cylindrical percolator, previously prepared by packing the outlet with purified cotton. A small amount of the solvent may be used to rinse the container and the rinsing added to the percolator. The drug is allowed to macerate for a suitable period of time (from 1 to 12 hours or over night, depending upon the drug to be assayed). Then the drug is firmly packed, a pledget of purified cotton placed above it, and percolated slowly with the solvent until the drug is completely exhausted of its alkaloid contents. Complete extraction of the alkaloid is determined by evaporating about 4 cc. of the last percolate to dryness, dissolving the residue in 0.5 cc. of approximately half-normal acid and adding a drop of mercuric iodide T.S. (Valser's Reagent) or, when testing for caffeine or colchicine, a drop of iodine T.S.: not more than a slight turbidity should be produced. The percolate is then treated for the purification of the alkaloids.

C. Continuous Extraction—An accurately weighed portion of the ground drug is placed in an extraction thimble and the thimble inserted into a suitable extractor (a Soxhlet extractor of appropriate size is satisfactory). The drug is moistened with the specified solvent and mixed by means of a stirring rod and allowed to stand about 5 minutes. It is then made alkaline with the specified quantity of ammonia T.S. and thoroughly mixed. The stirring rod is rinsed with a small portion of the solvent and the drug macerated for 6 to 12 hours or over night. The drug is then covered with a pledget of purified cotton, packed in the thimble, a sufficient quantity of solvent is added and the drug extracted for a specified period of time or until completely extracted.

Purification of the Alkaloids—The alkaloidal solution obtained by any of the extraction methods is usually contaminated with other extractives which interfere with the volumetric or gravimetric determination of the alkaloids. To effect their purification, the alkaloids are removed from the immiscible solvent by shaking out with an acid, then the acid solution, after alkalization, usually with alkali hydroxide, is extracted with an immiscible solvent.

The volume and strength of the acid to be used are usually left to the discretion of the operator. It is best, however, to keep the total volume as small as possible. For the first extraction, it is advisable to use at least 10 cc. of approximately normal acid or sufficient to render the mixture distinctly acid. When the drug contains a large amount of fat the use, for the first extraction, of a smaller volume of more concentrated acid may be advantageous in preventing emulsions. For succeeding extractions, it is preferable to use a dilution of 5 cc. of the acid with 5 cc. of distilled water. In all assays, the extraction should be continued until 0.5 cc. of the last acid washing shows not more than a slight turbidity on the addition of a drop of mercuric iodide T.S. (Valser's Reagent), or, in the case of caffeine and colchicine, on the addition of a drop of iodine T.S. The acid extracts, before proceeding with the next step, should be clear or practically so. If not clear, filter or treat as follows: Shake the combined acid extracts with one or more 10-cc. portions of the appropriate im-

miscible solvent until the acid solution is clear or practically so. Then wash the immiscible solvent extracts with one or more 5-cc. portions of distilled water acidified with hydrochloric or sulfuric acid, and add these washings to the acid solution.

The acid solution is then made alkaline, in most cases with ammonia T.S., and extracted with several successive portions of the appropriate immiscible solvent. The volume of the latter to be used in each operation is not less than half that of the aqueous solution, and the operation must be repeated as long as any alkaloid is extracted by the immiscible solvent. To determine the completion of extraction, evaporate 1 cc. of the last extraction and dissolve the residue in 0.5 cc. of approximately half-normal hydrochloric acid: the resulting solution should show not more than a slight turbidity on the addition of a drop of mercuric iodide T.S. (Valser's Reagent) or, in the case of caffeine and colchicine, on the addition of a drop of iodine T.S. The number of extractions required depends largely on the character of the alkaloid. With most alkaloids it is advisable to extract several times before testing.

Washing—The stems of separators and funnels and the lips of flasks, separators and graduates, from which solvents, containing alkaloids, have been drawn or poured, should be carefully washed with some of the solvent to prevent loss and to remove any of the alkaloids left by evaporation. These washings should be added to the other extractions containing the alkaloids.

Determination of Alkaloids—The solution of the purified alkaloids in the immiscible solvent is carefully evaporated to dryness on a steam bath or with a current of air. When the alkaloidal residue is to be determined volumetrically it should be softened by the addition of about 1 cc. of neutral alcohol or ether, an accurately measured volume of volumetric acid added, usually one and one-half to twice the volume required for the quantity of alkaloid present, and the mixture gently warmed to insure the complete solution of the alkaloid. If preferred, the alkaloidal residue may be dissolved in chloroform, the standard acid added, and the chloroform completely removed by evaporation. A sufficient quantity of distilled water is added to make the volume of the mixture measure at least 25 cc. and the excess of acid titrated with volumetric alkali, using 1 to 2 drops of the appropriate indicator.

When the alkaloidal residue is to be weighed, it is dried to constant weight at 100–110° C. If the final solvent has been chloroform, the last traces of that solvent should be removed by the addition of a few cc. of neutral ether or alcohol, followed by evaporation. Care must be taken to avoid loss by decrepitation, especially when evaporating chloroformic solutions of nux vomica alkaloids. Decrepitation may usually be prevented by the addition of a little alcohol after the solution has been reduced to a volume of 1 or 2 cc., evaporating at a low temperature, and rotating the container during the evaporation.

Indicators—Methyl red T.S. is to be used as the indicator in volumetric determinations. The same solution of indicator used in titrating the alkaloids should also be used in evaluating the volumetric solutions.

Aliquots—When using "aliquots," the solvent and the aliquot should be measured at the same temperature. When handling volatile liquids, a lower temperature and a more quickly conducted operation reduce the loss by evaporation.

Apparatus for Proximate Assays—When a container of definite size and shape is recommended in a proximate assay process, it is understood that this is advisory and not obligatory, except when volumetric flasks, measuring burettes, or other exact measuring apparatus are specified.

Adsorbents—In assaying fluidextracts, tinctures and other preparations of alkaloid-bearing drugs, it is often necessary to evaporate these to dryness and, to avoid loss and to aid in the evaporation, they are usually added to some adsorbent material. Paper pulp or asbestos fibers, should be used for this purpose. Such adsorbent material must be acid- and alkali-washed and then rendered neutral by washing with distilled water and dried before use.

Emulsions—The shaking or rotation of an aqueous solution with an immiscible solvent in a separator should ordinarily be continued for about 1 minute. Long or violent agitation should be avoided as emulsions are likely to form, especially in alkaline solutions. Hyoscyamus, belladonna and stramonium leaves sometimes contain saponins which cause troublesome emulsions. Should emulsions prove persistent, draw off the emulsified portion and add an excess of either solvent. This usually breaks the emulsion and permits a complete separation. It is sometimes preferable to break the separated emulsion by the addition of a small amount of anhydrous sodium sulfate. If this is done it becomes necessary to wash the residue with additional solvent to remove the alkaloid completely.

Emulsification is sometimes prevented by increasing the volume of the aqueous or of the immiscible solvent. Chloroform and ether solutions of drugs which contain large proportions of fat may form troublesome emulsions. In such cases it is advisable to add sufficient sulfuric acid to assure acidity, and to evaporate the volatile solvent, while stirring with a rubber-tipped glass rod. When the resinous and fatty matter has been agglutinated, cool the acid solution and filter it through a small, wetted filter into a separator. Redissolve the residue in 15 cc. of ether, add 5 to 10 cc. of tenth-normal acid, evaporate the ether as before, with continued stirring, and pour the acid solution through the filter into the separator. Repeat the extraction of the fatty residue with dilute acid two or three times and finally wash the filter free from alkaloids.

Pyrogen Test

Test Animal—Use healthy rabbits weighing 1000 Gm. or more which have been maintained for at least 1 week on a uniform diet and have not lost weight. Test the thermometer to determine the time required to reach maximum temperature. If the animals have not been previously used for such tests, take four rectal temperature readings on each of the animals at 2-hour intervals 1 to 3 days before use. Insert the thermometer beyond the internal sphincter, and allow it to remain a sufficient time to reach maximum temperature, but in no case less than 90 seconds, before the reading is recorded. Discard those animals with a temperature in excess of 39.8° C. On the day of the test take a control temperature reading before the injection of the test material. Animals may be used for the test and in subsequent tests after a rest period of not less than 2 days, provided the control temperature reading taken on the day of the test does not exceed 39.8° C. The reading taken on the test day constitutes the normal temperature of the test animal from which a subsequent rise due to the injection of the test material is calculated. Keep test animals in individual cages protected from disturbances likely to cause excitement. Exercise particular care to avoid exciting the animals on the day of taking the control temperatures and on the test day. Withhold food from any animal used, beginning 1 hour before the first temperature reading, and permit no food until the day's

record is completed. Free access to water is allowed. Keep the animals at uniform temperatures ($\pm 5^{\circ}$ C.) during the control and test period. They should preferably be housed in quarters maintained at constant temperature and humidity.

Conduct of the Test—Warm the product to be tested to approximately 37° C. and inject 10 cc. per Kg. of rabbit, intravenously through the marginal ear vein within 15 minutes subsequent to the control temperature reading on the day of the test. Record the temperature 1 hour subsequent to the injection and each hour thereafter until three recordings have been made. Syringes and needles used for these injections must have been treated to render them pyrogen-free and then sterilized. Not less than five rabbits shall be used for each test and the test shall be considered positive if three or more of the five animals show an individual rise in temperature of 0.6° C. or more above the normal established for each of these animals. If only one or two of the five animals show a positive response the test must be repeated on a second group of five additional animals. The test shall be considered positive if two of the second group of five animals show an individual rise in temperature of 0.6° C. or more above the normal established for these animals.

Reference Standards

The following Reference Standards have been provided by the Pharmacopœia as a basis of comparison for official assays. The U. S. P. Reference Standards are those prepared under the supervision of the Committee of Revision and distributed through the office of the Chairman, by the authority of the Board of Trustees of the U. S. Pharmacopœial Convention.

In the case of many biologically active substances the Permanent Commission on Biological Standardization of the Health Organization of the League of Nations has adopted standards expressing potencies in terms of units. In those cases in which U. S. P. Reference Standards are issued for these substances the U. S. P. Units are essentially the same as those defined by the League of Nations Commission, unless otherwise indicated.

The following U. S. P. Reference Standards are available:

Cod Liver Oil Reference Standard, standardized for its Vitamin A potency

Cod Liver Oil Reference Standard, standardized for its Vitamin D potency

Cod Liver Oil Reference Standard, standardized for its Vitamin D potency and distributed only for use in standardizing poultry food by the "chick method," using the assay established by the Association of Official Agricultural Chemists (see J. A. O. A. C., Vol. 22, p. 81, Feb., 1939, and "Official and Tentative Methods of Analysis of the A. O. A. C.," Fifth Edition, 1940)

Ascorbic Acid Reference Standard

Cholic Acids Reference Standard

Digitalis Reference Standard

Epinephrine Reference Standard

Ergotoxine Ethanesulfonate Reference Standard

Estrone Reference Standard
Zinc-Insulin Crystals Reference Standard
Menadione Reference Standard
Nicotinic Acid Reference Standard
Ouabain Reference Standard [water content, 11 per cent (U. S. P.
20 per cent)]
Posterior Pituitary Reference Standard
Riboflavin Reference Standard
Sulfanilamide Reference Standard
Thiamine Hydrochloride Reference Standard
Trypsin Reference Standard

Refractive Index (For Liquids)

The refractive index (n) of a transparent substance is the ratio of the velocity of light in air to its velocity in that material under like conditions. It is equal to the ratio of the sine of the angle of incidence made by a ray in air to the sine of the angle of refraction made by the ray in the material being tested. This physical constant is used as a means for identification of, and detection of impurities in, volatile oils. The Abbé refractometer measures the range of indices of the Pharmacopœial materials for which these values are given. Other refractometers of equal or greater accuracy may be employed at the discretion of the operator.

Rosin Test

In testing for rosin as an adulterant in resins, gum resins, and balsams, unless otherwise directed, place in a small mortar 1 Gm. of the substance, powdered or crushed if necessary, and add 10 cc. of purified benzin. Triturate well for 1 or 2 minutes, filter into a test tube, and add to the filtrate 10 cc. of a fresh aqueous solution of cupric acetate (1 in 200). Shake well and allow the liquids to separate: the benzin layer should not show a green color.

Solubilities

The statements concerning solubilities given under the heading *Solubility*, in the Pharmacopœial monographs are not intended as standards or tests for purity, but primarily as information required by those employed in connection with the preparation and dispensing of medicines. However, when a special test involving solubility is given, or in case of solubility of volatile oils in alcohol of specific strengths, the test for such solubility is intended as a test for purity and the substance must conform to the test.

The solubility of Pharmacopœial compounds in the given solvents is considered to be of minor importance as a means for their identification or determination of purity; for these purposes dependence is placed upon the other tests directed in the monographs.

When the exact solubility (*General Notices*, page 3) of a Pharmacopœial substance is not known, a descriptive term is used to indicate its solubility. The following table indicates the meanings of such terms:

<i>Descriptive Terms</i>	<i>Relative quantity of solvent for 1 part of solute</i>
"Very soluble".....	Less than 1 part
"Freely soluble".....	From 1 to 10 parts
"Soluble".....	From 10 to 30 parts
"Sparingly soluble".....	From 30 to 100 parts
"Slightly soluble".....	From 100 to 1000 parts
"Very slightly soluble".....	From 1000 to 10,000 parts
"Practically insoluble".....	More than 10,000 parts

Sterility Test for Liquids

When a test for the sterility of a liquid is prescribed, the following procedures shall be used:

Broth for Sterility Tests—

Beef steak (freed of fat, tendons, and bone).....	500 Gm.
Peptone.....	10 Gm.
Sodium Chloride.....	5 Gm.
Distilled Water, a sufficient quantity,	
To make.....	1000 cc.

Grind the beef steak in a meat grinder. Add 1000 cc. distilled water, mix well, and allow the mixture to infuse in a refrigerator for not less than 18 and not more than 24 hours. Remove it from the refrigerator, heat it in streaming steam at 100° C., for 1 hour and then under a pressure of 15 pounds (121.5° C.) for 30 minutes. Finally squeeze it through cheese cloth until the broth measures 1000 cc. If unable to obtain this amount by pressure, make up the volume with distilled water.

To 1000 cc. of this broth add the peptone and sodium chloride and mix well until they are dissolved. Adjust the reaction of this mixture to a pH of 7.6, using normal sodium hydroxide, and then heat in steam at 100° C. for 30 minutes.

Again determine its reaction and, if necessary, adjust it with normal sodium hydroxide to 0.2 point above the specified pH. Now filter the product through a wet filter, transfer it to chemically clean containers and finally sterilize the broth in an autoclave for 20 minutes at 15 pounds pressure.

The Test—To test for sterility pour this broth into Smith fermentation tubes or suitable substitutes so that each will contain not less than 25 cc. of the nutrient broth, and again sterilize at 15 pounds pressure for a period of 30 minutes. Finally incubate the tubes for a period of at least 24 hours at 37° C.

To these tubes add 1 cc. of an aqueous, 1 per cent, sterile, dextrose solution for each 25 cc. of the broth, steam the tubes at 100° C. for not less than 30 minutes and allow them to cool. The air liberated by the steaming must be removed from the tubes by tilting.

Plant half of the tubes with 5 drops of the liquid to be tested, and the other half with 20 drops of the same material.

Final readings for sterility shall be made after 7 days of incubation at 37° C. When the liquid to be tested renders the test broth turbid, make transfers at the end of 7 days from the tubes originally planted to others freshly steamed. These tubes to which the transplants have been made shall also be observed for 7 days.

When the liquid in bulk containers is tested for sterility, 10 cc. shall be planted from each container holding more than 1 liter, and at least 3 cc. from each container holding less than 1 liter. When the product in final containers is tested, 3 per cent of the total number shall be tested, but the number need not exceed ten from any one lot of containers. Preservative, if present, shall be so diluted in planting that its activity does not exceed that of phenol in a dilution of 1 to 10,000.

If growth appears in any tube, the test shall be repeated, using double the number of tubes employed in the first test. If contamination is found, the liquid shall be discarded or treated in such manner as to render it free from living microorganisms.

Sterility Tests for Solids

Broth for Sterility Tests under Aerobiosis—

Beef steak (freed of fat, tendons, and bone).....	500 Gm.
Peptone.....	10 Gm.
Sodium Chloride.....	5 Gm.
Dextrose.....	10 Gm.
Distilled Water, a sufficient quantity,	
To make.....	1000 Gm.

Grind the meat. Add 1000 cc. of distilled water; mix well, and keep cold in a refrigerator for from 18 to 24 hours. Remove, with a piece of absorbent cotton, any scum of fat which may be present. Then strain through cheese cloth and squeeze the meat as dry as possible. The amount of fluid recovered should almost equal the amount of water added. Alternative method: thoroughly mix the beef with the distilled water, heat at 100° C. for 1 hour, strain through cheese cloth, and press the meat as dry as possible.

Dissolve the peptone, sodium chloride, and dextrose in the liquid obtained by either method. Add sufficient normal sodium hydroxide so that the preliminary reaction, after diluting with distilled water, to 1000 cc., is pH 7.6. Filter through a wet filter paper until clear, distribute it in quantities of 40 cc. each in chemically-clean, preferably sterile test tubes (approximately 25 mm. by 200 mm.); plug these with gauze-wrapped, non-absorbent cotton and sterilize in an autoclave at from 15 to 20 pounds pressure (121.5° to 126.5° C.) for from 20 to 30 minutes, or by any other suitable method. The final reaction should be between pH 7.2 and pH 7.4.

Do not use culture medium which has been kept longer than 2 weeks at room temperature or 4 weeks under refrigeration.

Broth for Sterility Tests under Anaerobiosis—

Litmus Test Solution.....	10 cc.
Gelatin.....	20 Gm.
Broth for Sterility Tests under Aerobiosis, a sufficient quantity,	
To make.....	1000 cc.

The "broth prepared for aerobiosis" need not be filtered or sterilized before the addition of the other ingredients. Dissolve the gelatin in the broth with the aid of gentle heat, add the litmus T.S., and adjust the preliminary reaction to pH 7.6. Then, if necessary, add the albumen of two fresh eggs or its equivalent in desiccated egg al-

bumen, heat to coagulate and add distilled water to make 1000 cc.; filter until clear and distribute the filtrate in quantities of 40 cc. each, as described under the broth for testing aerobic organisms. Sterilize in an autoclave at from 15 to 20 pounds pressure (121.5° to 126.5° C.) for from 20 to 30 minutes, or by any other suitable method. The final reaction should be between pH 7.2 and pH 7.4.

The 10 cc. of litmus T.S. may be replaced by 0.2 Gm. of azolitmin if preferred.

Do not use culture medium which has been kept longer than 2 weeks at room temperature or 4 weeks under refrigeration.

Honey Medium for Molds and Yeasts—

Peptone.....	10 Gm.
Honey.....	60 cc.
Distilled Water, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the peptone in the distilled water with gentle heat, add the honey, and adjust the preliminary reaction to pH 6.0. Filter if necessary and sterilize in an autoclave at from 15 to 20 pounds pressure (121.5° to 126.5° C.) for from 20 to 30 minutes or by any other suitable method. The final reaction should approximate pH 5.6.

Sterilized Distilled Water—

Distribute distilled water in quantities of 40 cc. each in chemically clean, preferably sterile, test tubes. Plug the tubes with gauze-wrapped, non-absorbent cotton, and sterilize in an autoclave as directed under *Aqua Destillata Sterilisata*, page 65.

Inactivating Fluids for Inactivating Bacteriostatic Agents—

Fluids A and B are used for removing the various chlorine, iodine, or mercury compounds which are employed as bacteriostatic agents in the tubing fluids used in the packaging of sutures. Fluid C is necessary as a preliminary inactivating fluid if the chemical analysis shows that the sutures contain copper salts. If bacteriostatic agents, other than those above designated are used, appropriate sterile inactivating fluids and appropriate sterile washing agents must be employed so as to remove effectively the bacteriostatic and inactivating agents, which if present would interfere with bacterial growth in the subsequent test for sterility.

Inactivating Fluid A

Sodium Thiosulfate.....	10 Gm.
Sodium Carbonate.....	10 Gm.
Distilled Water, a sufficient quantity,	
To make.....	1000 cc.

Mix, filter if necessary, and distribute in quantities of 40 cc. each, in chemically-clean, dry, sterile test tubes. Sterilize in an autoclave at from 15 to 20 pounds pressure (121.5° to 126.5° C.) for from 20 to 30 minutes.

Inactivating Fluid B

Sodium Thiosulfate.....	100 Gm.
Distilled Water, a sufficient quantity,	
To make.....	1000 cc.

Mix, filter if necessary, and distribute in quantities of 40 cc. each, in chemically-clean, dry, sterile test tubes. Sterilize in an autoclave at from 15 to 20 pounds pressure (121.5° to 126.5° C.) for from 20 to 30 minutes.

Inactivating Fluid C

Ammonium Chloride.....	50 Gm.
Stronger Ammonia Water.....	15 cc.
Distilled Water, a sufficient quantity,	
To make.....	1000 cc.

Dissolve the ammonium chloride in enough distilled water to make 1000 cc., filter if necessary, and sterilize in an autoclave at from 15 to 20 pounds pressure (121.5° to 126.5° C.) for from 20 to 30 minutes. Add 15 cc. of stronger ammonia water, and distribute the solution aseptically in quantities of 40 cc. each, in chemically-clean, dry, sterile test tubes.

Petrolatum-paraffin Mixture for an Anaerobic Seal—

Petrolatum, having a melting point of 48° C.....	50 Gm.
Paraffin, having a melting point of 57° C.....	50 Gm.

Liquefy the ingredients by gentle heat, mix, and distribute, preferably in quantities of 50 or 100 cc. each, in chemically clean, dry test tubes or other containers. Sterilize in a hot air oven at 170° C. for 2 hours or by any other suitable method.

SUGGESTED TECHNIQUE FOR CONDUCTING TESTS FOR STERILITY

Carry out all bacteriological tests under the most rigid aseptic conditions. Wherever possible, tests should be carried out by two operators working together. The outside wearing apparel of the operators should consist of sterile caps, gowns, and face masks to cover the nose and mouth, and all manipulations should be conducted in a small, dust-proof room supplied with filtered air under positive pressure. The air in the testing room should be sprayed with water and the room itself washed with a disinfectant each time transfers are to be made, or at least once daily when in use, the room being allowed to remain closed for 15 minutes thereafter.

Opening Packages and Containers—

*For Purified Cotton, Gauze, Surgical Dressings, and Related Products—*Flame with care the carton, package, container, or one of the margins if in an envelope, to remove adhering dust particles. Remove material from the package with sterile forceps. Sterilization of the latter is effected in an autoclave or by wrapping the forceps and heating them in a hot-air oven at 170° C. for 2 hours. Between successive transfers thoroughly flame the forceps. If scissors are needed, sterilize them by the technique directed for forceps.

*For Sutures—*If necessary make a file line in the center of the tube or about 10 mm. above any tubing fluid. Then place the tubes in a suitable, active disinfecting solution for 24 hours. Remove the tubes with sterile forceps and place them between sterile towels. As an alternative method of sterilization, flame the tubes, preferably in a wing flame, avoiding the heating of the contents.

Removing and Culturing Contents—Take portions of the substance in triplicate from the cartons, wrapped packages, envelopes, and similar containers. The ma-

terial to be tested should be taken from various locations within the roll of purified cotton, gauze, surgical dressing, or related material, preferably from the outer end, center, and core, using sterile instruments and equipment. Transfer these portions of the material, as rapidly as possible, to the necessary number of tubes of medium for aerobic and anaerobic culturing, and also to tubes of honey medium for detecting molds and yeasts. Before use, heat the culture medium for anaerobiosis at 100° C. for 15 minutes and cool quickly. Seal the inoculated anaerobic medium with a thick (3 cm.) layer of sterile petrolatum-paraffin mixture. Place the sealed tubes immediately in a 37° C. incubator or in a cool water bath to solidify the seal. The time between the removal of the medium from the steam bath and the pouring of the seal should not exceed 15 minutes when examining sutures, and 30 minutes when examining other solids. Cultures of sutures are incubated at 37° C. for 15 days before negative results are recorded. Other products are to be incubated as directed above for 7 days before negative results are recorded. The cultures in honey medium for yeast and fungi are to be incubated for 15 days at from 22° to 25° C. before negative results are recorded.

In the case of sutures, break the tube at the filed line preferably by holding against it a red-hot, curved wire. Transfer the entire suture or loop or strand of gut, with the points of the sterile forceps, to the test tube containing 40 cc. of sterile distilled water, replace the cotton plug, and incubate the tube at 37° C. for 24 hours. Then transfer the gut to a test tube containing 40 cc. of sterile inactivating fluid A, using the necessary precautions to prevent contamination, and again incubate at 37° C. for 24 hours.

If a chemical analysis of at least four sutures of any lot reveals that the sutures are impregnated with more than 2 per cent of a mercury compound or more than 5 per cent of chlorine or iodine compounds, use sterile inactivating fluid B instead of the above. If the sutures upon chemical analysis have been found to contain copper, transfer the suture, after treatment with 40 cc. of sterile distilled water, to 40 cc. of sterile inactivating fluid C and again incubate at 37° C. for 24 hours.

It may also be necessary to employ other appropriate sterile inactivating fluids if bacteriostatic agents other than mercury, iodine, or chlorine compounds have been used. If inactivating fluid B or inactivating fluid C, or special inactivating fluids are used, follow by placing the suture in 40 cc. of sterile inactivating fluid A. That the inactivating fluid used may not interfere with bacterial culturing, an additional step is necessary before the transfer of the suture to the culture medium. This is to wash the suture, after treatment with the inactivator, in another tube of 40 cc. of sterile distilled water. Finally place the suture in each of the three tubes of medium to test for aerobes, anaerobes, and for molds and yeasts as detailed above.

Confirm all positive cultures showing growth, by a microscopic examination of stained smears.

At the end of the period of incubation inoculate at least 5 per cent of all negative aerobic suture cultures showing no growth, with 1 cc. of a 1 to 100,000 dilution of an 18 to 24 hour broth-culture of *E. coli* and incubate at 37° C. for 3 days. Inoculate at least 5 per cent of all negative anaerobic suture cultures showing no growth with 1 cc. of a 1 to 100,000 dilution of an 18- to 24-hour broth culture of *C. novyi* and incubate at 37° C. for 3 days. Inoculate at least 5 per cent of all negative yeast and mold suture cultures showing no growth, with 1 cc. of a 1 to 1000 dilution of a 72-hour honey medium culture of *Monilia albicans* and incubate at from 22° to 25° C. for 3

days. Failure of growth is evidence that bacteriostatic agents which may have been carried over in the transfer are present.

Controls

Tubes of media, distilled water, and inactivating fluid are preferably placed in cans or baskets before sterilization and then covered by paper hoods. Incubate all tubes of culture media immediately after their preparation, for 48 hours at 37° C. and then for 48 hours at room temperature. Discard tubes showing growth. Culture aerobically and also anaerobically 10 cc. of the distilled water used in these tests and also each of the inactivating fluids, immediately after their preparation. If any of the tubes used in testing show growth the entire stock of material they represent must be discarded.

When testing any material for sterility, the following controls are to be conducted simultaneously:

a. Inoculate two tubes of each of the culture media to be used with 10 cc. of the distilled water used and incubate for 15 days.

b. Carry out a similar test as in *a* but replace the distilled water with the inactivating fluid used. If more than one inactivating fluid is to be employed, each one must be tested separately.

c. Seal two tubes of the anaerobic culture medium with a 3-cm. layer of the petrolatum-paraffin mixture and incubate for 15 days to determine the sterility of the anaerobic seal.

d. The culture medium to be used for anaerobic culturing should support growth upon inoculating 40 cc. with 1 cc. of a 1 to 100,000 dilution of an 18- to 24-hour broth culture of *C. novyi*. The culture medium to be used for aerobic culturing should support growth upon inoculating 40 cc. with 1 cc. of a 1 to 100,000 dilution of *E. coli*. Incubate inoculated tubes for 72 hours at 37° C. The culture medium used for molds and yeasts should support growth upon inoculating 40 cc. with 1 cc. of a 1 to 1000 dilution of a 72-hour honey medium culture of *Monilia albicans* and incubating at 22° to 25° C. for 3 days.

Sterilization Processes

"Sterilization" refers to the destruction of all living organisms and their spores in, or their removal from, materials. This may be accomplished in various ways.

Cleansing—Preparatory to sterilization, all containers and especially glassware and stoppers must be thoroughly cleansed by a suitable method. Boiling for not less than 10 minutes in water to which a suitable soap has been added, followed by rinsing in water and another boiling in from 0.1 per cent to 0.3 per cent HCl or HNO₃ is advocated. When necessary, special cleaning fluids are used to remove organic matter not affected by previous washing. Thorough rinsing with water followed by freshly distilled water is practiced as the final treatment in all instances. It is important to see that each container is filled with the various solutions during the washing treatment as well as with water during the rinsings.

The effective methods of sterilization most frequently employed for empty containers, apparatus and materials used in the manufacture of preparations for injection and for sterilizing the latter are presented.

Process A—

Direct Flame—(This process employed in sanitary procedures is known also as incineration. The latter is used for the sterilization of substances which have little or no value. Burning such materials in a furnace or flame is practiced.) Usefulness of the direct flame for the sterilization of articles possessing definite value is limited to those which are not injured or adversely affected by the application of a hot flame, as the Bunsen flame. Platinum, nichrome, and other metallic needles and wires, iron and nickel spatulas, tweezers and forceps are quickly sterilized by heating to redness in a Bunsen or alcohol flame. Slabs, mortars and one-piece pestles, stoneware, metallic orifices of bacteria-proof filters, or any metallic ware may, in emergencies, be sterilized in the direct flame of a Bunsen burner, provided that the application of such direct flame is for a period of not less than 20 seconds to each part thus treated. Care must be taken to be assured that the article to be treated will not be broken or injured by this technique. Though slides and cover-slips, glass rods and the lips of tubes, bottles and flasks may be sterilized by passing them through a flame for the period of time previously mentioned, such procedure is not recommended for glassware, as there is always the possibility of breaking the latter by heating in a direct flame. Other safe methods described below should be used. However, if a small number of ampuls are needed as containers for a preparation to be dispensed quickly, such ampuls, if not already sterile, can be sterilized, in an emergency, in the direct flame, using care and supporting them (neck-downward) in the meshes of a wire basket until cool, when they are to be filled immediately and quickly sealed.

Process B—

Dry Heat—Dry or hot-air heat has a limited use. However, exposure to dry heat in a suitable hot-air sterilizer or oven is the usual procedure for sterilizing all empty glass, porcelain and metallic containers which are *to be kept on hand for future use*. Such containers can readily be sterilized in an autoclave and this technique should be used if containers are required for immediate use or need not be dry. Containers made of heavy or thick glass (as gallon bottles or carboys) are best sterilized in the autoclave. All materials sterilized by dry heat (hot-air) must be thoroughly clean and free from traces of organic matter. To insure sterilization of materials by this method, they should be exposed to a temperature not below 170° C., preferably for two hours, but never for less than one hour. To avoid the cracking of glassware, both heating and subsequent cooling in this and other heating sterilization processes should be done gradually. A thermo-regulating valve may be used but a recording thermometer must be present on the sterilizer. All objects sterilized by this or any other process should be suitably wrapped or protected so that they remain sterile. Non-absorbent cotton plugs or other suitable stoppers in flasks and other containers must be wrapped on the outside with a piece of metallic foil or with a layer of gauze or muslin, or covered with stout paper and secured with cord around the neck of the container. Adequate attention must be given to the preparation of the materials to be sterilized in a hot-air oven as well as to the details of loading this and other types of sterilizers used in the different sterilization processes. All materials should be distributed and arranged loosely in the chamber or in other sterilizers. Avoid tight packing. In sterilizing combustible articles in a hot-air chamber, it should be remembered that cotton and paper are browned at 190° C. and over. Apparatus or material not stoppered or wrapped with inflammable coverings, as

Petri dishes, pipettes and ampuls (placed in metallic containers), and jars stoppered with metallic or enamel tops can be sterilized at a temperature of 200° C. or higher and for at least 45 minutes.

Substances, as glycerin, petrolatum oils, oily solutions and suspensions, fats and powders, which resist penetration by moist heat, may be more conveniently sterilized in a hot-air oven, where a prolonged uniform temperature can be obtained. Oily solutions or suspensions, oils, ointment vehicles, and powders in covered Petri dishes (in strata not more than $\frac{1}{4}$ inch in thickness) which are not decomposed or otherwise affected by the treatment, are sterilized at a temperature of at least 170° to 180° C. for not less than one hour, care being taken that the *entire contents* in each container is maintained at this temperature for the designated time period. For medicaments, as sulfanilamide, which are decomposed at high temperatures, a lower temperature for a more prolonged period (140° C. for four hours) may be used.

Process C—

Steam under Pressure (Heating in an Autoclave)—The use of steam under pressure makes available moist heat at temperatures higher than that obtainable by boiling water under normal pressure. By this means, spores as well as vegetative forms of bacteria are destroyed by one short exposure. It is the most satisfactory method of heat sterilization available. It is the method which is to be used for sterilizing preparations for injection and is applicable to the sterilization of any material or object which is not injured by moisture and the high temperature employed, and which can be conveniently placed in the apparatus at hand. The steam pressure kettle may be used for small-scale operations. In the laboratory, the device most commonly used is the autoclave. Steam pressure sterilizers intended for the sterilization and drying of surgical material, dressings and other hospital equipment are constructed in different shapes and sizes, in various designs and types, and of different kinds of material. The successful use of an autoclave or steam sterilizer depends upon its proper operation. Skill and experience on the part of the operator are required. Adequate attention must be given to the preparation of the materials to be sterilized as well as to the details of loading. It is advisable to remove all the air possible by a preliminary vacuum by reducing the pressure to 250 mm. (10 inches) of mercury for 15 minutes, and provision should be made for the escape of the residual air from the bottom of the chamber during the process of sterilization. Where a preliminary vacuum is not used, the exposure should be prolonged for at least twice the period of time given below. Heating a mixture of steam and air under pressure will yield a lower temperature than is attained by steam alone generated under like pressure. Furthermore, air pockets prevent diffusion of the steam and the latter may not reach infective objects and materials. All autoclaves should be equipped with thermometers, located in the exhaust line and at the lowest point in the sterilizer. The temperature actually attained is more reliable than pounds of pressure recorded. Exposure to saturated steam under 15 pounds of pressure at 121.5° C. for at least 20 minutes in an autoclave properly loaded and operated will destroy all living organisms including spores. A higher pressure for the same period of time or a longer exposure at the pressure mentioned is to be used, depending upon the load in the autoclave. Time must be allowed for the steam to penetrate to the center of the material or substance to be sterilized. The usual steam pressures employed, the corresponding temperatures attained, and the necessary periods of time

required, after reaching the indicated temperature, to assure adequate sterilization are:

- 10 pounds pressure (115.5° C.) for 30 minutes
- 15 pounds pressure (121.5° C.) for 20 minutes
- 20 pounds pressure (126.5° C.) for 15 minutes

Process D—Moist Heat at 100° C.—

1. **Free-Flowing Steam**—Exposure to live or free-flowing steam (100° C.) yields results similar to those obtained with boiling water. At high altitudes where the atmospheric pressure is less than at sea level, the temperature at which water boils and that of free flowing steam is below 100° C. In industries on a large scale, where large quantities of live steam are available, the latter is used for destroying the vegetative forms of bacteria in tanks, refrigerators, and other containers.

Free-flowing steam (under atmospheric pressure) is used extensively in the laboratories. Different types of equipment have been designed to utilize the moist heat of free-flowing steam. False bottoms placed in covered buckets or wash boilers provide apparatus useful as steam sterilizers. The Arnold sterilizer, however, is the type most frequently employed. The steam in the latter can be used continuously or intermittently. One prolonged exposure to steam (at 100° C.) may be employed; and this can replace the boiling water bath. In practice, the *intermittent*, *fractional*, *interrupted*, or *discontinuous* method of sterilization, also known as Tyndallization, is used most frequently with the Arnold sterilizer. In this procedure, the material is exposed to free-flowing steam (at 100° C.) for periods of time varying from 30 to 60 minutes on each of at least three consecutive days. During intervals between heating in all fractional methods of moist-heat sterilization, materials should be kept either at room temperature or in an incubator at body temperature. This method of sterilization is not to replace autoclaving or the use of steam under pressure if either of the latter is suitable. In noting the time of exposure in this or any other sterilizing technique, note the time after the entire contents in the containers have reached the required temperature and keep the materials at this temperature for the designated length of time. Allow the sterilizer to cool before removing the contents.

2. **Boiling Water**—Instruments, hypodermic needles, catheters, syringes, rubber tubing, and stoppers may be sterilized by boiling in water. The water should submerge the materials or be above the level of the fluid to be sterilized. Boiling is to be continued for at least 15 minutes. The addition of 1 to 2 per cent of sodium carbonate or 5 per cent phenol or 2 to 3 per cent saponated solution of cresol will increase the sterilizing efficiency of the boiling water bath.

Solutions which are not adversely affected by a temperature of 100° C. but which are affected by higher temperatures, and which are in sealed sterile containers may be sterilized in a bath of boiling water if a steam sterilizer is not available. Exposure of the entire contents from 30 to 60 minutes at 100° C., on each of three consecutive days, is required. During intervals between heating, keep at room temperature or in an incubator at body temperature.

If time does not permit more than one heating period, and fractional sterilization is required or applicable as in an emergency when preparations are prepared ex-temporaneously, heating for at least one period should be conducted. One heating at 100° C. for 30 minutes in a steam sterilizer with a bacteriostatic agent added to the preparation should be carried out.

Process E—

Fractional Moist-Heat Sterilization at Low Temperatures (Inspissation)—Materials which are injured by a temperature of 100° C. or higher are treated in the manner described in Process D-1, except that the temperature in the water bath or inspissator is maintained at the highest temperature which the substances being treated can bear without decomposing or being altered. Usually this is between 60° and 80° C. Frequently the fractional heating is extended over a period of from 4 to 7 days. Medicinal preparations treated by this method shall contain an added bacteriostatic agent, unless the ingredients possess bacteriostatic properties. The added bacteriostatic agent must be in a concentration which will prevent the growth of all microorganisms in the materials.

This process is not a safe method of sterilization. Process F is to be used in its place wherever applicable.

Process F—

Bacteriological Filtration—This term is employed to indicate a bacteria-free filtrate in contrast to other methods of filtration in which the resultant product is not necessarily sterile. This method is employed for sterilizing those liquids in which the active agents are soluble and which in many instances are injured by heat. Bacteriological filters used to obtain bacteria-free filtrates are made of porcelain, diatomaceous earth, asbestos, sintered glass, and other materials. They are available in different sizes and in different degrees of porosity. Some forms of apparatus are fitted with suitable filtering pads or disks or membranes. The pads or disks, also available in various degrees of porosity, are used only once and then discarded. The other types of filters are tested at frequent intervals to determine their efficiency. Suction or pressure is usually employed to force liquids through these filters.

New filters should be cleansed, sterilized, and tested for impermeability to bacteria with a broth culture of a suitable microorganism. Thereafter, each time before the filter is used, it is to be examined for flaws and the entire filter apparatus and attachments, including the receiving vessels, are to be cleansed and sterilized by a suitable method, preferably by Process C. The liquid to be filtered should first be either centrifuged or filtered, if necessary, through paper pulp or a fine filter paper to remove visible suspended particles and to reduce clogging. After use, bacteriological filters should be cleansed immediately, and then sterilized. Liquid petrolatum and other oils are not to be sterilized by this method as they may increase the permeability of the filter to bacteria. This process is exceedingly complicated. It is not a simple mechanical procedure governed only by the relative size of the pores of the filter and of the particles to be filtered, but a consideration of many factors is involved. The most important are: the composition and electrical charge of the filter; the pH and electric charge of the material being filtered; the adsorption of protein and other substances; the temperature, pressure, and the duration of the procedure.

Bacteriological filtration may not function perfectly under all conditions. It is important to determine in all instances that solutions thus treated have been rendered sterile and not otherwise altered. Medicinal preparations treated by this method shall contain a bacteriostatic agent unless otherwise directed in an individual monograph.

When preparations in bulk for injection are sterilized by this process, the distribution, filling, and sealing in the final containers must be conducted under strictly aseptic conditions.

Process G—

1. **Saline Baths**—A boiling, saturated solution of sodium chloride or of ammonium chloride has a temperature almost equal to that obtained in the autoclave at 15 pounds pressure in the case of the sodium chloride solution and a somewhat lower temperature in the case of the ammonium chloride solution. In both instances the temperatures are very much higher than that of boiling water. Containers (especially sealed ampuls) holding material which can withstand the temperature of the autoclave at 15 pounds pressure may be sterilized in these saline baths provided identical temperatures are attained.

2. **Oil Bath**—Surgical and other instruments can be sterilized by boiling in a light, mineral oil. (Light Liquid Petrolatum is satisfactory.) The oil can be used repeatedly. A temperature of 160° C. for 60 or more minutes is employed. By this method, injury to the finish and the cutting edge of instruments is avoided. In the case of glass and metallic catheters, not only sterilization, but lubrication also is effected.

Process H—

Aseptic Manipulation—Preparations which would be decomposed or otherwise injured by other processes of sterilization, or preparations which are required to be sterilized in an emergency, may be prepared by aseptic manipulation. Always have on hand the following sterile materials: containers (various sizes of bottles, ointment jars, collapsible metal tubes), funnels, filter paper, cotton, distilled water, isotonic solution of sodium chloride, ointment vehicles, stoppers, boric acid, zinc oxide, talc, etc. Containers, bottles, ointment jars, collapsible metal tubes (placed in wide-mouth stoppered containers), graduates, pipettes, and similar equipment, are cleansed and sterilized by Process B or Process C. Packs of filtering paper (wrapped in paper or placed in covered dishes or jars), powders (not decomposed by high temperatures) placed in covered dishes or jars in strata not more than $\frac{1}{4}$ inch in thickness, fixed oils, ointment vehicles, glycerin, cotton and muslin or straining cloths and funnels wrapped in paper (filtering paper or cotton as needed may be placed within each funnel) are sterilized by Process B. Cork and rubber stoppers are cleansed, placed in wide-mouth stoppered containers, and sterilized by Process C. Spatulas and glass rods are wrapped and sterilized by Process B, Process C, or Process A. All utensils used in the preparation of the finished product must be sterile. Ingredients are to be weighed on sterile paper or sterile watch glasses. The actual compounding is to be conducted within a restricted area under a cover and in such a manner that contamination will not occur. A bacteriostatic agent shall be added in all instances, when Process H is used unless otherwise directed in an individual monograph.

Process H is to be used only when other processes of sterilization are not applicable, and the label is to indicate the date when prepared and the notation: "Prepared by aseptic manipulation. Keep in a cool place and use within two (2) days."

Note on Sterilizing by Heating Processes

If the volume of the solution in each container exceeds 10 cc. or if dry materials are present in amounts exceeding 2 Gm., it is important to see that the materials are exposed to the designated temperature for a period of time sufficient to be assured that the *entire contents* in each of the respective materials attain the required temperature, and are kept at that temperature for the time periods mentioned above. This may necessitate exposure for longer time intervals than indicated above.

The use of thermocouples is advocated when sterilizing heavy loads so as to determine the actual temperature and duration attained in the center of the load.

When sterilization of injections can be effected by Process C or Process F without decomposing or otherwise changing the injection so treated, these processes are to be used.

Sterilization of injections by heating processes is carried out preferably in the final container in which the injection is dispensed.

Sulfur Determination, Parr Bomb Method

In the determination of total sulfur in organic material by means of the Parr Peroxide Bomb, the material being examined is intimately mixed with sodium peroxide and an ignition accelerator, either potassium chlorate or potassium perchlorate, sealed tightly in the fusion cup of an especially designed bomb made of corrosion-resisting metal, and ignited either electrically or by heating externally with a flame. The fused mixture is dissolved in water, acidified with hydrochloric acid, gaseous by-products expelled by boiling, and the sulfate ion determined in the usual manner by precipitation with barium chloride. The operation of the bomb is simply carried out, and there can be no danger of an explosion resulting if the procedure for the ignition is followed without variation.

Caution—It is desirable, however, to place the bomb inside a piece of steel pipe when the charge is ignited, to prevent possible injury to the operator if the bomb should burst.

There are several modifications of the bomb available, all with adequate instructions accompanying them, and any one of the several forms may be used. The bomb consists of three essential parts: a fusion cup to receive the charge, a cover grooved to fit over the rim of the fusion cup, and a collar by means of which the cup and cover may be held together firmly. The groove in the cover is provided with a gasket by means of which a gas-tight seal is obtained, and this gasket should be examined frequently and replaced at once if it shows signs of damage.

The accelerator, potassium chlorate or potassium perchlorate, furnishes quickly a part of the oxygen required for combustion of the sample, and causes ignition to take place at a lower temperature. The accelerator, which must be powdered and free from lumps, is used in the amount of 1 Gm., and should be placed on the bottom of the fusion cup. (NOTE—For the combustion of organic compounds for the determination of halogens, 1 Gm. of powdered sodium or potassium nitrate is substituted for the potassium chlorate or perchlorate, no other change in the fusion procedure being made.)

Sodium peroxide provides the balance of the oxygen required for combustion, and also provides the alkali needed to absorb the carbon dioxide formed during combustion, thereby eliminating internal pressure. Use 15 Gm. of powdered sodium peroxide. This may be measured instead of weighed, using the scoop provided with the bomb. The supply of sodium peroxide must be kept in an air-tight container to prevent the absorption of moisture.

The quantity of material to be taken for analysis may vary somewhat according to its sulfur content, but in no instance should the sample exceed 0.5 Gm. in weight. If less than that weight of material is used, the difference in weight should be made up by the addition of powdered sucrose, to produce a sufficient heat of combustion to bring about a complete combustion. Likewise, if the full weight of material be

taken but its carbon content does not exceed 60 per cent, 0.25 Gm. of powdered sucrose should be added to furnish additional carbon.

To avoid the possibility of premature combustion, it is desirable to adhere to a strict order of preparing the charge. The procedure recommended is to place 1 Gm. of finely powdered accelerator, free from lumps, in the bottom of the fusion cup, and add thereto the material to be tested, together with the auxiliary carbonaceous material, if required, mixing the powders thoroughly with a dry glass rod having a rounded end. Then add 15 Gm. (one scoopful) of sodium peroxide, likewise lump-free. The cover should then be placed on the fusion cup, the bomb sealed tightly, and the contents thoroughly mixed by shaking vigorously for 2 minutes. If electrical ignition is to be used, a piece of ignition wire of the proper diameter and length is fixed to the terminals on the cover before finally assembling the unit. After mixing the charge by shaking vigorously, the charge should be settled by tapping the edge of the bottom on a hard surface.

When electrical ignition is used, the amount of current needed to fuse the ignition wire should be determined in advance and the resistances set at the proper point. External ignition is best obtained by allowing the pointed flame of a blast lamp to impinge upon the bottom or side of the fusion cup for a brief period. When ignition occurs the combustion will be complete in 1 minute, after which the bomb may be cooled, disassembled, and the fused mixture dissolved for determination of sulfate ion. The exact procedure to be followed throughout is described under *Thiaminae Hydrochloridum*, page 500.

The quantity of sulfur in the reagents used must be determined by following the directed procedure, using 0.5 Gm. of powdered sucrose alone, and the correction so obtained applied in the calculation of the result. The blank determination must be repeated whenever any new lot of reagent is used.

Tensile Strength Determination

Unless otherwise directed, a tensile testing machine should be used in an atmosphere having a relative humidity of 65 per cent, ± 2 per cent, and a temperature of 21°C. , $\pm 1.1^{\circ}\text{C.}$ (70°F. , $\pm 2^{\circ}\text{F.}$).

Tensile Strength of Surgical Sutures—The tensile strength of surgical sutures is to be determined on a motor-driven tensile strength testing machine using the principle of the constant specimen-rate-of-load, having suitable clamps for holding the specimen firmly. This description applies specifically to that known as the Incline Plane Tester.

The clamp for holding the specimen shall be of the roll type, with a flat gripping surface. The roll shall have a diameter of 0.75 inch, and the flat gripping surface shall be not less than 1 inch in length. The length of the specimen, when inserted in the clamps, shall be 5 inches from nip to nip. When a specimen breaks within 0.5 inch of the nip of the clamp, that reading shall be discarded.

The carriage used in any test shall be of such a weight that when the break occurs, the position of the recording pen on the chart shall be between 20 per cent and 80 per cent of the capacity that may be recorded on the chart.

The friction in the carriage must not exceed that which will permit the recording pen to depart from the zero line of the chart at a point not exceeding 2.5 per cent of the capacity of the chart when no specimen is held in the clamps.

The speed of inclination of the plane of the tester shall be such that it will reach

its full inclination of 30° from the horizontal in 20 seconds, $\pm$ 1 second, from the start of the test.

The tensile strength of Surgical Gut shall be determined immediately after removal from the tubing fluid, without drying of the specimen.

The tensile strength of Surgical Silk, and of Sterile Surgical Silk that has been packaged dry, shall be determined after the Silk has been conditioned 4 hours in an atmosphere having a relative humidity of 65 per cent, $\pm$ 2 per cent, at a temperature of 21° C., $\pm$ 1.1° C. (70° F., $\pm$ 2° F.).

The tensile strength of Sterile Surgical Silk that has been packaged in a tubing fluid shall be determined immediately after removal from the tubing fluid, without drying or conditioning of the specimen.

When placing the specimen in the jaws of the testing machine, clamp one end of the suture, pass the other end through the opposite clamp, apply a tension of about $\frac{1}{4}$ of the required minimum tensile strength of the suture to the free end of the specimen, and close the second clamp. Perform as many breaks as are required in the respective monographs.

Tensile Strength of Textile Fabrics—The tensile strength of textile fabrics, including Adhesive Plaster, is to be determined on a constant-speed, or pendulum type of testing machine, having suitable clamps for holding the specimen securely.

The clamps for holding the specimen, in a pendulum type tester, shall have smooth, flat, parallel jaws. The dimension of all gripping surfaces parallel to the direction of application of the load shall not be less than 1 inch (25.4 mm.). When the width of the strip being tested does not exceed 0.75 inch, the jaws of the clamp should be at least 1 inch in width. If the width of the strip is greater than 0.75 inch and not greater than 1.75 inch, the width of the jaws of the clamp should be at least 2 inches. If the width of the specimen is greater than 1.75 inch, cut a 1-inch strip and use a clamp with jaws not less than 2 inches in width. All edges which might have a cutting action on the specimen shall be rounded to a radius of $\frac{1}{64}$ inch (0.4 mm.).

The jaws of the pendulum type tester shall be 3 inches (76.2 mm.) apart at the beginning of the test, and shall separate at the rate of 12 inches, $\pm$ $\frac{1}{2}$ inch (30.5 cm., $\pm$ 13 mm.), per minute.

The pendulum type testing machine shall be of such capacity that when the break occurs, the deviation of the pendulum from the perpendicular shall be not less than 9° nor more than 45°.

Thermometers for Pharmacopœial Testing

These thermometers conform to the specifications of the American Society for Testing Materials, the specifications being designated as follows:

<i>Types</i>	<i>A.S.T.M. designation</i>
I—For general purposes.....	E1 (1C-39)
II—For general purposes.....	E1 (2C-39)
III—For petrolatum and other Type III melting points.....	E1 (14C-39)
IV—For determining kinematic viscosity.....	E1 (18C-39)
V—For determining the titer of fatty acids.....	E1 (36C-41T)

The stem of each thermometer shall be made of suitable thermometer tubing and

shall have a plain front and an enameled back. All graduation lines, figures, and letters shall be clear-cut on the glass stem and shall be uniformly well filled with insoluble colored pigment.

Thermometer Specifications

Thermometer Type	I	II	III	IV	V
Liquid	Mercury	Mercury	Mercury	Mercury	Mercury
Filling above liquid	Nitrogen	Nitrogen	Nitrogen	Nitrogen	Nitrogen
Temperature range	-20° to +150° C.	-5° to +300° C.	38° to 82° C.	34° to 42° C.	-2° to +68° C.
Subdivisions	1° C.	1° C.	0.1° C.	0.1° C.	0.2° C.
Total length	303 to 307 mm.	379 to 383 mm.	365 to 371 mm.	252 to 256 mm.	385 to 390 mm.
Stem diameter	6.0 to 7.0 mm.	6.0 to 7.0 mm.	6.0 to 7.0 mm.	6.0 to 7.0 mm.	6.0 to 7.0 mm.
Bulb diameter	5.0 to 6.0 mm.	5.0 to 6.0 mm.	Not greater than stem	5.0 mm. to diam. of stem	5.5 to 7.0 mm.
Bulb length	19 to 25 mm.	10 to 15 mm.	Not over 28 mm.	25 to 35 mm.	15 to 25 mm.
Bottom of bulb to graduation line at distance	-18° C. 90 to 100 mm.	0° C. 100 to 110 mm.	38° C. 105 to 115 mm.	34° C. 135 to 150 mm.	-2° C. 50 to 60 mm.
Top of thermometer to graduation line at distance	150° C. 20 to 35 mm.	300° C. 25 to 50 mm.	82° C. 25 to 40 mm.	42° C. 20 to 35 mm.	68° C. 20 to 35 mm.
Longer graduation lines at each	5° C.	5° C.	0.5° C.	0.5° C.	1° C.
Graduations numbered at each multiple of	10° C.	10° C.	1° C.	1° C.	2° C.
Immersion	76 mm.	76 mm.	79 mm.	Total	45 mm.
Scale error at any point, when standardized, shall not exceed	0.5° C.	1° C.	0.1° C.	0.1° C.	0.2° C.

The bulb of each thermometer shall be made of Corning normal or equally suitable thermometric tubing.

The thermometers shall be so thoroughly annealed that there will be no appreciable change in their indications after long-continued exposure to the highest temperature on the scale.

For further details regarding the standardization of these thermometers, reference should be made to A.S.T.M. Standards, Part III, American Society for Testing Materials.

Thiamine Hydrochloride or Vitamin B₁ Assay

The assay of products for thiamine hydrochloride or vitamin B₁ potency shall be by comparison with the Thiamine Hydrochloride Reference Standard, by assay procedure conforming in all respects to the following specifications:

The assay, comprising the recording of observations of rats throughout specified periods of their lives while being maintained on specified dietary regimens and the interpretation of such data, is as follows:

Preliminary Period—Throughout the preliminary period each rat shall be raised under the immediate supervision of, or according to directions specified by, the

assayer. Throughout the preliminary period the rats shall be maintained on a dietary regimen which shall provide for normal development in all respects, except that the thiamine hydrochloride intake may be restricted.

Depletion Period—A rat shall be suitable for the depletion period when the age of the rat does not exceed 30 days, and if the body weight of the rat does not exceed 50 Gm. and if the animal manifests no evidence of injury or disease or anatomical abnormality which might hinder growth and development. Throughout the depletion period each rat shall be provided with the thiamine hydrochloride test diet and water (U. S. P.) *ad libitum*, and during this period no other dietary supplement shall be available to the animal. Throughout the depletion period and until the assay shall have been completed the rats shall be kept in cages provided with a wire cloth bottom, each mesh of which shall be not less than 8 mm.

Assay Period—A rat shall be suitable for the assay period provided that the depletion period shall not have exceeded 75 days, and provided that the rat shall manifest evidence of thiamine hydrochloride deficiency characterized by acute polyneuritis. Throughout the assay period each rat shall be kept in an individual cage and provided with the thiamine hydrochloride test diet, compounded from the same lots of ingredients, and water (U. S. P.) *ad libitum*. On the day beginning the assay period there shall be administered to each rat a single dose of the reference standard of such size that it will produce in individual animals a curative period of not less than 5 days and not more than 15 days. All of the rats used in any one assay shall receive the same quantity of the reference standard. Each rat shall then be observed for the cure of and recurrence of polyneuritis, and when polyneuritis reaches the same acute stage observed when the reference standard was administered, a single dose of the assay product shall be administered. The animals shall then be observed to determine if polyneuritis is cured, and if so, observation shall be made of the duration of the period. Each assay shall include successive administration of the reference standard and assay product to not less than eight rats. The assay product may be administered orally or parenterally but in any one assay the reference standard shall be administered in the same manner as the assay product, and the quantity of the assay product administered to each rat shall be the same.

Recording of Data—On the day beginning the depletion period and at intervals of not more than 7 days during the depletion period, a record shall be made of the body weight of each rat. On about the twenty-fifth day and each day thereafter for the remainder of the depletion period, each rat shall be observed for symptoms of polyneuritis. The following dates shall be recorded:

1. The day on which the reference standard is administered.
2. The day on which cure of polyneuritis is observed following the administration of the reference standard.
3. The day on which acute polyneuritis recurs and the assay product is fed.
4. The day on which cure of polyneuritis is observed following the administration of the assay product.
5. The day on which acute polyneuritis recurs after the administration of the assay product.

Thiamine Hydrochloride or Vitamin B₁ Potency of the Assay Product—In determining the thiamine hydrochloride potency of the assay product the duration of the curative period following the administration of the reference standard and the assay product shall be considered. The dose of the assay product administered contains

an amount of the thiamine hydrochloride equal to or greater than that contained in the dose of the reference standard administered if that quantity promotes in the assay animals a total curative period (the sum of the number of days of the curative period of each of the animals) equal to or greater than the total curative period produced by administration of the reference standard.

Definitions—As used herein, unless the context otherwise indicates, the term *acute polyneuritis* means that stage of thiamine hydrochloride deficiency in which the animal regains control of the voluntary muscles, as evidenced by standing or walking, a few seconds after extreme muscular contraction, which has been induced by twirling the rat by its tail (the onset of acute polyneuritis is invariably accompanied by loss in body weight). The term *assay period* means the interval in the life of a rat between the last day of the depletion period and the final observation following the administration of the assay product; the term *assay product* means a product under examination for its thiamine hydrochloride potency; the term *curative period* is the interval of time between the administration of thiamine hydrochloride and the subsequent recurrence of acute polyneuritis after a complete disappearance of polyneuritic symptoms, and the duration of the curative period is expressed as the number of days in that interval; the term *cure of polyneuritis* means the complete disappearance of polyneuritic symptoms and is invariably accompanied by increase in body weight; the term *depletion period* means the interval in the life of a rat during which its food intake is only the thiamine hydrochloride test diet and water (U. S. P.); the term *preliminary period* means the interval in the life of a rat prior to the depletion period; the term *reference standard* means the Thiamine Hydrochloride Reference Standard, distributed by the Board of Trustees of the U. S. Pharmacopoeial Convention, and which contains one U. S. P. unit of thiamine hydrochloride in each 3 micrograms of the dried material; the term *thiamine hydrochloride test diet* means a uniform mixture, which has not been compounded for more than 7 days, of the following food materials and in the proportions designated:

Thiamine Hydrochloride or Vitamin B₁ Test Diet—

Sucrose.....	60.25	per cent
Casein (1).....	18	per cent
Salt Mixture (2).....	4	per cent
Autoclaved Yeast (3).....	5	per cent
Autoclaved Peanuts (4).....	10	per cent
Purified Liver Extract (5).....	0.75	per cent
Cod Liver Oil.....	2	per cent

(1) The casein shall be free from demonstrable traces of thiamine hydrochloride.
 (2) The salt mixture shall be either salt mixture No. 1, described on page 637, or a salt mixture having essentially the same proportions of the elements.

(3) Dried yeast which has been autoclaved in steam at 15 pounds pressure for 5 hours with the yeast spread in a layer not more than 6 mm. in depth and then dried at a temperature not exceeding 65° C.

(4) Unroasted shelled No. 1 grade Virginia peanuts are crushed in a food chopper, autoclaved in steam at 15 pounds pressure for 5 hours with the ground peanuts spread in a layer not more than 12 mm. in depth, and then dried at a temperature not ex-

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ceeding 65° C. This preparation may be incorporated in the basal diet by grinding with the requisite quantity of sucrose.

(5) Dissolve 100 Gm. of Extract of Liver* in 1 liter of 0.6 per cent sodium bisulfite solution. Let stand 24 hours in a well-stoppered bottle; acidify with hydrochloric acid to a pH of 1.5. Concentrate by distillation under reduced pressure at a temperature not exceeding 50° C. to one-half the original volume. Dry on vitamin B₁-free casein at a temperature not exceeding 65° C.

Suggestions for Using the Thiamine Hydrochloride Reference Standard

Before preparing a solution of the Reference Standard, dry it to constant weight in a desiccator over phosphorus pentoxide.

Precautions to Be Taken in the Preparation of Solutions—Because of the hygroscopic nature of the completely desiccated U. S. P. Thiamine Hydrochloride Reference Standard, it is preferable to transfer the quantity required for a test to a small glass-stoppered weighing bottle, in which it can then be weighed on a microbalance, or an ordinary balance according to the number of tests for which it is to be used. Even without such precautions, however, exposure to the air during weighing will not cause an increase in weight of more than about 0.6 per cent, if the operations are completed within 5 minutes.

Neutral and alkaline solutions of thiamine hydrochloride are unstable, and aqueous-acid solutions are readily infected by moulds, which inactivate the vitamin. Therefore, stock solutions should be prepared using 25 per cent alcohol and containing sufficient hydrochloric acid to make the solution approximately five-hundredth normal. A convenient strength for a stock solution is 0.5 mg. of thiamine hydrochloride to each cc. These solutions are stable if stored at about 4° C.

Solutions of suitable strength for animal dosage (20 to 100 micrograms per cc.) must be made at least twice weekly from the stock solution by dilution with distilled water. Such dilutions must be kept at a low temperature and examined daily for mold.

Turbidimetric Tests

These tests are applied to certain official chemicals, to insure the absence of excessive amounts of chloride or sulfate.

In carrying out these turbidimetric tests, the following points are to be observed: The same quantities of the same reagents must be used in the test of the substance under examination and in the control test. The glass cylinders in which the tests are made must be of the same diameter and match in all other respects as closely as possible. The precipitating reagent must be added to both in immediate sequence.

Chloride—The prescribed quantity of the substance to be tested is dissolved in from 30 to 40 cc. of distilled water, and the solution neutralized, if necessary, with nitric acid, using litmus paper as the indicator. One cc. of nitric acid and 1 cc. of silver nitrate T.S. are added and then sufficient distilled water to make 50 cc. After mixing well and allowing to stand 5 minutes protected from direct sunlight, the

*The Extract of Liver used in this "Test Diet" must contain, in each Gm., at least that amount of material from liver which, when given daily to patients with pernicious anemia, has produced a satisfactory hematopoietic response.

turbidity, if any, is compared with that produced in a control test made with the specified volume of fiftieth-normal hydrochloric acid.

Bismuth salts are first dissolved in a few cc. of distilled water and 2 cc. of nitric acid, then diluted with distilled water to 50 cc.

Sulfate—The specified quantity of the substance to be tested is dissolved in from 30 to 40 cc. of distilled water, and the solution neutralized, if necessary, with hydrochloric acid, using litmus paper as the indicator. One cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S. are added and then sufficient distilled water to make 50 cc. After mixing well, it is allowed to stand for 10 minutes and the turbidity, if any, is compared with that produced in a control test made with the specified volume of fiftieth-normal sulfuric acid.

If the solution, after the addition of acid, is not perfectly clear, it is filtered through a filter paper free from chloride or sulfate, then the silver nitrate or the barium chloride is added.

When the tests for chloride or sulfate are to be applied to a specified volume of a solution of a substance prepared as directed in the text, and the permissible limit for these impurities corresponds to 0.2 cc. or less of fiftieth-normal hydrochloric or sulfuric acid, the solution is not to be further diluted. The control test is also made with the same volume of water (or other specified solvent) as in the test.

In applying the turbidimetric tests to salts of heavy metals, which normally show an acid reaction, their aqueous solutions prepared for the test are not to be neutralized.

Vegetable and Animal Drugs, Methods for Sampling and Analysis

I—Sampling from Original Containers—

I-a—It is recommended that gross samples of vegetable or animal drugs in which the component parts are 1 cm. or less in any dimension, and all powdered or ground drugs, be taken by means of a sampler which removes a core from the top to the bottom of the container, not less than two cores being taken in opposite directions; that when the total weight of the drug to be sampled is less than 100 kilos (200 pounds) at least 250 Gm. shall constitute an *official sample*. When the total weight of the drug to be sampled is in excess of 100 kilos, repeated samples shall be taken by the above method, and according to the schedule given below, mixed and quartered, two of the diagonal quarters being rejected, the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same manner until two of the quarters weigh at least 250 Gm., which latter quarters shall constitute an *official sample*.

I-b—It is recommended that gross samples of vegetable drugs in which the component parts are over 1 cm. in any dimension be taken by hand. When the total weight of the drug to be sampled is less than 100 kilos, at least 500 Gm. shall constitute an *official sample*, and this shall be taken from different parts of the container or containers. When the total weight of the drug to be sampled is in excess of 100 kilos, repeated samples shall be taken by the above method and according to the schedule below, mixed and quartered, two of the diagonal quarters being rejected, and the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same manner until two of the quarters weigh not less than 500 Gm., which latter quarters shall constitute an *official sample*.

SCHEDULE RECOMMENDED FOR SAMPLING

<i>Number of packages in shipment</i>	<i>Number of packages to be sampled</i>
1 to 10	1 to 3
10 to 25	3 to 4
25 to 50	4 to 6
50 to 75	6 to 8
75 to 100	8 to 10

When over 100, the total number sampled should not be less than 10.

I-c—When the total weight of a drug to be sampled is less than 10 kilos it is recommended that the above methods be followed but that somewhat smaller quantities be withdrawn, and in no case should the final *official sample* weigh less than 125 Gm.

I-d—In addition to the withdrawing of *official samples* according to methods I-a, I-b, and I-c, the *official sample* may consist of the total amount of a direct purchase made by Federal, State, or Municipal Food and Drugs Act enforcement officials.

II—Foreign Organic Matter in Whole Vegetable Drugs—

Withdraw from 25 to 500 Gm. from the *official sample*, spread out in a thin layer, and separate the foreign organic matter by hand as completely as possible. Weigh it and determine the per cent of foreign organic matter, calculated upon the weight of drug taken. Use the maximum quantity of sample for coarse or bulky drugs.

III—Preparation of Vegetable or Animal Drugs for Analysis—

The following method is to be used where specific directions are not otherwise given in the text: Withdraw as much as may be necessary of the *official sample* by quartering, taking pains to see that the portion is representative of the gross sample. In the case of unground or unpowdered drugs, grind the withdrawn sample so that it will pass through a No. 20 standard mesh sieve. If the sample cannot be ground, reduce it to as fine a state as possible. Mix by rolling it on paper or sampling cloth, spread it out in a thin layer and withdraw the portion for analysis. The disintegration of semi-solid drugs may be facilitated by the use of a meat grinder or a similar apparatus.

IV—Total Ash in Vegetable Drugs—

Accurately weigh a quantity of the ground drug, representing from 2 to 4 Gm. of the air-dried material, in a tared crucible and incinerate at a low temperature, not to exceed very dull redness, until free from carbon, and determine the weight of the ash. If a carbon-free ash cannot be obtained in this way, exhaust the charred mass with hot distilled water, collect the insoluble residue on an ashless filter paper, incinerate the residue and filter paper until the ash is white or nearly so, then add the filtrate, evaporate it to dryness, and heat the whole to a low redness. If a carbon-free ash cannot be obtained in this way, cool the crucible, add 15 cc. of alcohol, break up the ash with a glass rod, burn off the alcohol, and again heat the whole to a low redness. Finally determine the weight of the ash. Calculate the percentage of total ash from the weight of the drug taken.

V—Acid-insoluble Ash in Vegetable Drugs—

Boil the ash obtained under paragraph IV with 25 cc. of diluted hydrochloric acid for 5 minutes, collect the insoluble matter on a tared Gooch crucible or ashless filter, wash with hot distilled water, ignite, and weigh. Determine the per cent of acid-insoluble ash calculated from the weight of drug taken.

Moisture in Vegetable and Animal Drugs**VI—Preparation of Sample—**

In the case of unground or unpowdered drugs, prepare about 10 Gm. of the *official sample* by cutting, granulating, or shredding, so that the parts are about 3 mm. in thickness. Seeds or fruits smaller than 3 mm. should be cracked. High-speed mills should not be used for preparing the sample and care should be taken that no appreciable amount of moisture is lost during the preparation and that the portion taken is representative of the *official sample*.

VII—Moisture Method for Drugs Containing No Constituents Volatile at 100° C.—

Accurately weigh about 10 Gm. of the drug as prepared under paragraph VI in a tared evaporating dish. Dry at a temperature of 100° C. for 5 hours, and weigh. Continue the drying and weighing at 1-hour intervals until the loss is not more than 0.25 per cent in 1 hour's drying.

VIII—Moisture Method for Drugs Containing Ether-soluble Constituents Volatile at 100° C.—

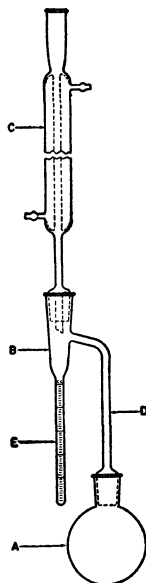
Proceed as under paragraph VII. Determine the volatile ether-soluble extractive (paragraph XV) and subtract the percentage of volatile ether-soluble extractive from the percentage lost during drying. The difference represents the percentage of moisture.

IX—Moisture Method by Toluene Distillation—

Apparatus—The apparatus (see illustration) required consists of a glass flask (A) connected by means of a trap (B) to a reflux condenser (C). All joints in the apparatus should be of ground glass. The flask should have a capacity of 500 cc., should be either of the short-neck, round-bottom type or of the Erlenmeyer type, and should be made of resistance glass.

The length of the trap should be between 235 and 240 mm., and the distance between the connecting tube (D) and the receiving tube (E) should be between 45 and 55 mm. The internal diameter of the connecting tube should be between 9 and 11 mm. and where sealed to the body of the trap should be inclined at an angle of 15° from the horizontal. The length of the cylindrical portion of the receiving tube should be between 146 and 156 mm., and the internal diameter of the neck of the trap should be between 22 and 24 mm. The receiving tube shall be graduated to contain 5 cc. and shall be subdivided into 0.1-cc. divisions, each 1-cc. line being numbered from 5 cc. at the top. The error in any indicated capacity may not be greater than 0.05 cc.

The jacket of the condenser should be approximately



Toluene Moisture Apparatus

400 mm. in length, and the inner tube of the condenser should have an external diameter between 9.5 and 12.7 mm. The end of the condenser that is inserted into the trap should be ground off at an angle of 30° from the vertical axis, and when inserted into the trap, the tip of the condenser should be about 7 mm. above the surface of the liquid in the trap after the distillation conditions have been established.

The source of heat is preferably an electric heater with rheostat control or an oil bath. The upper portion of the flask and the connecting tube may, if desired, be wrapped with asbestos paper or asbestos cord.

The receiving tube and the condenser must be chemically clean in order to permit the sharp separation of water. These parts should be cleaned with chromic acid cleansing mixture, thoroughly rinsed with distilled water, and dried in an oven.

The toluene used in the moisture determination should first be saturated with distilled water by shaking with a small quantity of distilled water, separating it from the excess water, and distilling the toluene.

Determination—Place in the dry flask a quantity of the substance, weighed accurately to the nearest centigram, which it is estimated will yield from 2 to 4 cc. of water. If the substance is of a pasty character, it is best weighed in a boat of metal foil of a size that will just pass through the neck of the flask. If the substance is likely to cause bumping, add enough dry sand to cover the bottom of the flask, or a number of capillary melting-point tubes, about 100 mm. in length, sealed at the upper end. Place about 200 cc. of toluene in the flask, connect the apparatus as illustrated, and fill the receiving tube (*E*) with toluene poured through the top of the condenser. Heat the flask gently for 15 minutes, and when the toluene begins to boil, distil at the rate of about 2 drops per second until most of the water has passed over; then increase the rate of distillation to about 4 drops per second. When the water has apparently all distilled over, rinse the inside of the condenser tube with toluene while brushing down the tube with a tube brush attached to a copper wire and saturated with toluene. Continue the distillation for 5 minutes, then remove the heat and allow the receiving tube to cool to room temperature. If any droplets of water adhere to the walls of the receiving tube, force them down with a rubber band wrapped around a copper wire and wet with toluene. When the water and toluene have separated completely, read the volume of water and calculate the percentage that was present in the substance.

X—Crude Fiber—

Exhaust a weighed quantity of the prepared drug (paragraph III), representing about 2 Gm. of the drug, with ether or use the residue from the determination of the volatile ether-soluble extractive (paragraph XV). Add 200 cc. of boiling sulfuric acid solution, adjusted to exactly 1.25 per cent by titration, to the ether-exhausted drug, in a 500-cc. flask, and connect the flask with a reflux condenser, the tube of which passes only a short distance below the rubber stopper, into the flask. Heat the mixture to boiling and continue the boiling exactly 30 minutes. Then filter through a linen or hardened-paper filter and wash the residue on the filter with boiling distilled water until no longer acid. Rinse the residue back into the flask with 200 cc. of boiling sodium hydroxide solution, adjusted to exactly 1.25 per cent by titration and free from sodium carbonate. Again heat the mixture to boiling and continue the boiling exactly 30 minutes under the reflux condenser as described under the treatment with acid, then rapidly filter through a tared filter, wash the residue with boiling distilled

water until the last washing is neutral, dry it at 110° C. until of constant weight, and note the weight. Now completely incinerate the dried residue and weigh the ash: the loss of weight is considered to be the weight of the crude fiber.

NOTE—The boiling with acid and alkali should continue *exactly* 30 minutes from the time that the liquid (which is cooled below the boiling point by adding it to the cold flask) again boils. After the solution has been brought to boiling, the flame should be turned low enough just to maintain boiling. During the boiling the flask should be gently rotated from time to time to catch any particles which may adhere to the walls of the flask. A slow current of air introduced into the flask during the boiling operation will be very helpful to keep down excessive frothing.

Extractives

XI—Alcohol-soluble Extractive—

Weigh 2 Gm. of the prepared drug (paragraph III) into a dried and tared paper extraction thimble, using a glass-stoppered weighing bottle as the container, and place 0.2 Gm. of sodium hydroxide in the receiving flask. Extract the drug in a continuous extraction apparatus with alcohol, during 5 hours. Dry the insoluble residue at 100° C. for 30 minutes and weigh. Determine the moisture in the drug by the *toluene distillation method*, page 629, calculate the weight of moisture in the quantity of drug taken for the test and subtract it from the original weight of the drug taken for the test. The difference between this result and the weight of the residue determined as directed above represents the amount of alcohol-soluble extractive.

XII—Diluted Alcohol-soluble Extractive—

Macerate about 2 Gm. of the prepared drug (paragraph III), accurately weighed, in about 70 cc. of diluted alcohol in a suitable flask. Shake the mixture during 8 hours at 30 minute intervals and then allow it to stand for 16 hours without shaking. Filter and wash the flask and residue with small portions of diluted alcohol, passing the washings through the filter, until the filtrate measures 100 cc. Evaporate a 50-cc. aliquot portion of this filtrate to dryness in a suitable tared dish on a water bath and dry to constant weight at 110° C. Calculate the percentage of this extractive from the weight of drug taken.

XIII—Purified Benzin-Soluble Extractive—

Extract completely about 2 Gm. of the prepared drug (paragraph III), accurately weighed, by subjecting it during 20 hours to the action of purified benzin in a continuous extraction apparatus. Transfer the benzin solution to a tared porcelain dish and allow it to evaporate spontaneously. Then dry it over sulfuric acid for 18 hours and weigh. Calculate the percentage of this extractive from the weight of drug taken.

XIV—Non-volatile Ether-soluble Extractive—

Proceed as directed under *Volatile Ether-soluble Extractive* (paragraph XV). The weight of the extract after drying in a desiccator and then at 110° C. until of constant weight represents the non-volatile portion of the extract.

XV—Volatile Ether-soluble Extractive—

Extract completely 2 Gm. of the prepared drug (paragraph III), dry over sulfuric acid for not less than 12 hours, and subject it, during 20 hours, to the action of abso-

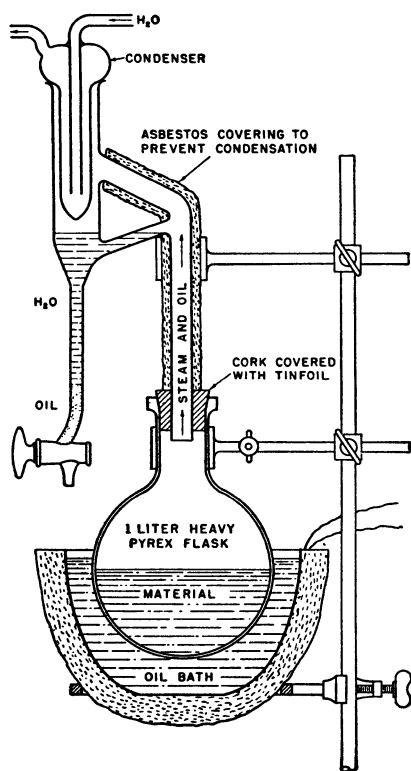
lute ether (page 672) in a continuous extraction apparatus. Transfer the ether solution to a tared porcelain dish and allow it to evaporate spontaneously. Then dry it over sulfuric acid during 18 hours and weigh the total ether extract. Now heat the extract gradually up to 110° C. until the weight becomes constant: the loss in weight represents the volatile portion of the extract.

XVI—Water-soluble Extractive—

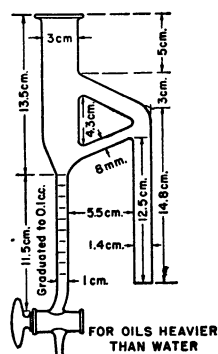
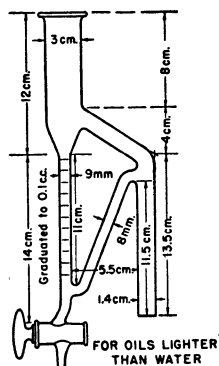
Proceed as directed under paragraph XII, using distilled water instead of diluted alcohol.

XVII—Volatile Oil Determination—

Set up an apparatus as shown in the illustration, using an appropriate volatile oil trap as illustrated. Use a suitable oil bath for heating.



Volatile Oil Apparatus



Weigh a sufficient quantity of the ground drug to yield, if possible, at least 2 cc. of the volatile oil, and place it in the round-bottomed flask. Add from 3 to 6 times

as much water as the drug, and mix uniformly. Boil the contents of the flask slowly during 4 to 8 hours, or until all the volatile oil has been distilled, taking care to avoid escape of vapors around the condenser.

With oils heavier than water, after the distillation is complete, transfer the oil to a graduated cylinder and draw off the water with any remaining oil into a small separator. Wash the oil trap with 10 cc. of ether, add the ether washings to the separator, shake and allow to separate. Draw off the aqueous layer and discard it. Evaporate the ether layer until the odor of ether is no longer perceptible, then drain the residue of oil into the graduated cylinder, and note the volume of the oil at 25° C.

If the oil content is to be determined by weight, add a small quantity of anhydrous sodium sulfate to the oil, agitate gently, decant the clear oil and determine its specific gravity at 25° C.

Viscosity, Kinematic

Viscosity is a property which is closely related to the resistance to flow of a liquid. It is defined in terms of the force required to move one plane surface past another under specified conditions when the space between is filled by the liquid in question. It can be considered more simply as a relative property where water is the reference material and all viscosities are expressed in terms of the viscosity of pure water at 20° C. The latter quantity is given as (very nearly) one *centipoise*, and a material ten times as viscous as water at this temperature has a viscosity of ten centipoises. The basic unit is the *poise*; for convenience, the *centipoise* (1 poise = 100 centipoises) is employed. The specifying of temperature is important because viscosity usually changes with temperature; in general, viscosity decreases as temperature is raised. While on the absolute scale viscosity is measured in poises or centipoises, it is more convenient to use the kinematic scale, in which the units are *stokes* and *centistokes* (1 stoke = 100 centistokes). The kinematic viscosity is obtained from the absolute viscosity by dividing the latter by the density of the liquid at the same temperature.

$$\text{Kinematic viscosity} = \frac{\text{absolute viscosity}}{\text{density}}$$

The sizes of the units are such that viscosities in the ordinary ranges are conveniently expressed in centipoises and centistokes. The magnitude of the viscosities of some common liquids at room temperatures may be indicated by the following relative figures:

<i>Substance</i>	<i>Approximate viscosity in centistokes</i>
Ether.....	0.2
Purified Benzin.....	0.6
Water.....	1
Kerosene.....	2.5
Liquid Petrolatum.....	20-70
Honey.....	10,000

Viscosity can be determined by any method which will measure the resistance to shear offered by the liquid. For ordinary liquids, it is customary to determine the time required for a given sample of the liquid to flow, at a regulated temperature,

through a small capillary tube, and to compare this time with that required by the reference liquid, such as water. If the viscosity of the reference liquid is known, the kinematic viscosity of the unknown liquid may be calculated simply. Many capillary tube viscosimeters have been devised; nearly all are modifications of the Ostwald type.

Values for Converting Kinematic Viscosity to Saybolt Universal Viscosity

Kinematic Viscosity, Centistokes	Equivalent Saybolt Universal Viscosity, Sec. (Basic Values, See Note)			Kinematic Viscosity, Centistokes	Equivalent Saybolt Universal Viscosity, Sec. (Basic Values, See Note)		
	At 37.8° C. (100° F.)	At 54.4° C. (130° F.)	At 98.9° C. (210° F.)		At 37.8° C. (100° F.)	At 54.4° C. (130° F.)	At 98.9° C. (210° F.)
2	32.6	32.7	32.8	31	145.3	145.6	146.3
2.5	34.4	34.5	34.6	32	149.7	150.0	150.7
3	36.0	36.1	36.3	33	154.2	154.5	155.3
3.5	37.6	37.7	37.9	34	158.7	159.0	159.8
4	39.1	39.2	39.4	35	163.2	163.5	164.3
4.5	40.7	40.8	41.0				
5	42.3	42.4	42.6				
6	45.5	45.6	45.8	36	167.7	168.0	168.9
7	48.7	48.8	49.0	37	172.2	172.5	173.4
8	52.0	52.1	52.4	38	176.7	177.0	177.9
9	55.4	55.5	55.8	39	181.2	181.5	182.5
10	58.8	58.9	59.2	40	185.7	186.1	187.0
11	62.3	62.4	62.7	41	190.2	190.6	191.5
12	65.9	66.0	66.4	42	194.7	195.1	196.1
13	69.6	69.7	70.1	43	199.2	199.6	200.6
14	73.4	73.5	73.9	44	203.8	204.2	205.2
15	77.2	77.3	77.7	45	208.4	208.8	209.9
16	81.1	81.3	81.7	46	213.0	213.4	214.5
17	85.1	85.3	85.7	47	217.6	218.0	219.1
18	89.2	89.4	89.8	48	222.2	222.6	223.8
19	93.3	93.5	94.0	49	226.8	227.2	228.4
20	97.5	97.7	98.2	50	231.4	231.8	233.0
21	101.7	101.9	102.4	55	254.4	254.9	256.2
22	106.0	106.2	106.7	60	277.4	277.9	279.3
23	110.3	110.5	111.1	65	300.4	301.0	302.5
24	114.6	114.8	115.4	70	323.4	324.0	325.7
25	118.9	119.1	119.7				
26	123.3	123.5	124.2	Over 70	Saybolt sec- onds = cen- tistokes × 4.620	Saybolt sec- onds = cen- tistokes × 4.629	Saybolt sec- onds = cen- tistokes × 4.652
27	127.7	127.9	128.6				
28	132.1	132.4	133.0				
29	136.5	136.8	137.5				
30	140.9	141.2	141.9				

NOTE.—To obtain the Saybolt Universal viscosity equivalent to a kinematic viscosity determined at t° F. multiply the equivalent Saybolt Universal viscosity at 100° F. by $1 + (t - 100) 0.000064$; for example, 10 centistokes at 210° F. are equivalent to 58.8×1.0070 or 59.2 Saybolt Universal seconds at 210° F.

Several types are described, and directions for their use given, by the American Society for Testing Materials.*

Viscosity for commercial products is often expressed on arbitrary scales, and measured by empirical methods in special instruments. Thus semi-solids are often examined by so-called rotary instruments, which measure the resistance to rotation of a cylinder, placed concentrically within another, the annular space being filled with the sample. The viscosity of oils is expressed on arbitrary scales, which vary from one country to another, there being several corresponding instruments. The most widely used are

England	—Redwood No. I and No. II
Germany	—Engler
United States	—Saybolt Universal
	Saybolt Furol

The Redwood No. II and the Saybolt Furol are designed for use with extremely viscous oils. This is done by providing a wider capillary for the measurement; the Saybolt Furol readings are approximately one-tenth those obtained on the same oil with the Saybolt Universal. Results for all the instruments are expressed in seconds of time required for outflow of a standard amount of liquid. Engler readings, however, may be reported as Engler degrees; these latter are obtained by dividing the efflux time for the sample by the corresponding efflux time for water in the same instrument and at the same temperature. Standard temperatures are adopted as a matter of convenience. For the Saybolt instruments, measurements are usually made at 100° and 210° F. Redwood measurements may be at several temperatures up to 250° F., and Engler degrees are usually reported at 20° and 50° C.

The determination of kinematic viscosity with modern instruments is more rapid and convenient than is the use of the Saybolt and similar equipment. The Ostwald pipette type viscosimeter is therefore displacing the metal capillary variety, although the Saybolt, Redwood, and Engler scales have been retained. Kinematic viscosities determined in the Ostwald pipettes are therefore converted to Saybolt and similar values by means of equations and conversion charts. The table on page 634 has been prepared by the American Society for Testing Materials.†

Vitamins A and D Assays

Definitions—As used herein, unless the context otherwise indicates, the term *assayer* means the individual immediately responsible for the interpretation of the assay; the term *assay group* means a group of rats to which the assay oil shall be administered during the assay period; the term *assay oil* means the oil under examination for its vitamin potency; the term *assay period for the Vitamin A assay* means the interval in the life of a rat between the last day of the depletion period and the twenty-ninth day thereafter or between the last day of the depletion period and the death of the rat; the term *assay period for the Vitamin D assay* means the interval in the life of a rat between the last day of the depletion period and the eighth day thereafter; the term *assemble* means the procedure by which rats are

* A.S.T.M. D-445-39T; A.S.T.M. Standards on Petroleum Products and Lubricants. Issued annually, Philadelphia, U. S. A.

† A.S.T.M., D-446-39, A.S.T.M. Standards on Petroleum Products and Lubricants, September (1940), issued annually, Philadelphia, Pa.

selected and assigned to groups for the purpose of feeding, care, and observation; the term *control group* means a group of rats receiving no assay oil during the assay period; the term *daily*, for the Vitamin A assay, means 6 days of each week of the assay period; the term *daily*, for the Vitamin D assay, means each of the first 6 days of the assay period; the term *declining weight* means the condition of a rat when the body weight of the rat on any given day is equal to or less than the body weight of the rat on the seventh day prior to the given day; the term *depletion period* means the interval in the life of a rat between the last day of the preliminary period and the first day of the assay period; the term *dose* means the quantity of the Reference Oil or of the assay oil to be fed daily to a rat during the assay period; the term *fed* means made readily available to the rat or administered to the rat by mouth; the term *ground gluten* means the clean, sound product made from wheat flour by the almost complete removal of starch, and contains not more than 10 per cent of moisture, and, calculated on the water-free basis, not less than 14.2 per cent of nitrogen, not less than 15 per cent of nitrogen-free extract (using the protein factor 5.7), and not more than 5.5 per cent of starch (as determined by the diastase method*); the term *group for the Vitamin A assay* means six or more rats maintained on the same required dietary regimen during the assay period; the term *group for the Vitamin D assay* means seven or more rats maintained on the same required dietary regimen during the assay period; the term *ophthalmia* means a pathological state of the eye and/or the conjunctiva and/or the tissues anatomically related to the eye, readily discernible macroscopically and usually associated with Vitamin A deficiency; the term *preliminary period* means the interval in the life of a rat between the seventh day after birth and the first day of the depletion period; the term *rachitogenic diet* means a uniform mixture of the food materials, and in the proportions named, in either of the following formulas:

Rachitogenic Diet No. 1

Whole Yellow Maize, ground 33 per cent
Whole Wheat, ground..... 33 per cent
Ground Gluten..... 15 per cent
Gelatin..... 15 per cent
Calcium Carbonate (U. S. P.) 3 per cent
Sodium Chloride (U. S. P.)... 1 per cent

Rachitogenic Diet No. 2

Whole Yellow Maize, ground 76 per cent
Ground Gluten..... 20 per cent
Calcium Carbonate (U. S. P.) 3 per cent
Sodium Chloride (U. S. P.)... 1 per cent

The term *Vitamin A test diet* means a food material consisting of the following proportions of the named ingredients of the quality specified:

Vitamin A Test Diet

Casein.....	18 per cent
Salt Mixture (see page 637).....	4 per cent
Yeast, dried.....	8 per cent
Starch.....	65 per cent
Vegetable Oil.....	5 per cent
Vitamin D, a sufficient amount	

* Official and Tentative Methods of Analysis, Association of Official Agricultural Chemists, fourth edition, 1940, page 359, method II; page 504, method 50.

Not less than 3 U. S. P. Units of Vitamin D shall be provided in each gram of diet and this vitamin shall be carried by the yeast or the vegetable oil. The ingredients of the Vitamin A test diet shall be free from Vitamin A or shall have been treated so as to reduce the Vitamin A content to such a degree that when the Vitamin A test diet is fed to the control group two-thirds or more of the rats shall manifest, prior to the eleventh day of the assay period, symptoms of Vitamin A deficiency characterized by both declining weight and ophthalmia. The dried yeast shall carry the Vitamin B complex in such concentration that a daily dose of 0.15 Gm. shall permit an average gain in weight of at least 3 Gm. per week in rats during an interval of 4 weeks between the twenty-fifth and sixtieth days of age, at which time the rats are provided ad libitum with a ration which is adequate for optimal growth, except that the ration shall be devoid of the Vitamin B complex.

Salt Mixtures

For preparing the salt mixtures the available form of each chemical is taken² furnish the stipulated equivalent of each chemical.

Salt Mixture No. 1

Calcium Carbonate (U. S. P.).....	134.8	Gm.
Magnesium Carbonate (U. S. P.).....	28.9	Gm.
Sodium Carbonate, anhydrous (U. S. P. Reagent).....	34.2	Gm.
Potassium Carbonate (U. S. P., dried at 180° C.).....	141.3	Gm.
Phosphoric Acid (U. S. P., 86.5 per cent).....	119.3	Gm.
Hydrochloric Acid (U. S. P., 36.5 per cent).....	148.3	Gm.
Sulfuric Acid (U. S. P., 96 per cent).....	9.6	Gm.
Citric Acid (U. S. P.).....	111.1	Gm.
Ferric Citrate (U. S. P. Reagent).....	7.44	Gm.
Potassium Iodide (U. S. P.).....	0.020	Gm.
Manganese Sulfate (U. S. P. Reagent).....	0.117	Gm.
Sodium Fluoride (U. S. P. Reagent).....	0.062	Gm.
Potassium Alum (U. S. P.).....	0.044	Gm.

Dissolve the citric acid in a sufficient quantity of hot distilled water and add the solution to the mixed carbonates. Then add the potassium iodide, manganese sulfate, sodium fluoride, and potassium alum, previously dissolved in distilled water. Then add the ferric citrate dissolved in the hydrochloric acid. Dilute the sulfuric acid with distilled water, add the phosphoric acid, and add this acid mixture to the mixture previously prepared and stir until effervescence ceases. Evaporate the final mixture to dryness, in a current of air at from 90° to 100° C. and reduce the resulting product to a fine powder.

NOTE—A salt mixture may also be prepared by combining suitable quantities of chemical compounds of such degree of purity as to produce a mixture having essentially the same proportions of the same elements as Salt Mixture No. 1.

Salt Mixture No. 2

Sodium Chloride (U. S. P.).....	1.73 Gm.
Magnesium Sulfate (U. S. P.).....	5.45 Gm.
Sodium Biphosphate (U. S. P.).....	3.47 Gm.
Potassium Phosphate (U. S. P. Reagent).....	9.54 Gm.
Calcium Biphosphate (U. S. P. Reagent).....	5.40 Gm.
Ferric Citrate (U. S. P. Reagent).....	1.18 Gm.
Calcium Lactate (U. S. P.).....	13 Gm.

Mix the finely powdered salts uniformly.

The assay of an oil for Vitamin A and Vitamin D potency shall be by comparison with the U. S. P. "Reference Cod Liver Oil," by assay procedures conforming in all respects to the following specifications:

Method of Assay for Vitamin A

The Vitamin A assay, comprising the recording of observations of groups of rats throughout specified periods of their lives, while being maintained on specified dietary regimens, and the interpretation of such data, are as follows:

Preliminary Period—Throughout the preliminary period each rat shall be raised under the immediate supervision of, or according to directions specified by, the assayer. Throughout the preliminary period the rats shall be maintained on a dietary regimen which shall provide for normal development in all respects, except that the supply of Vitamin A, or precursors of Vitamin A, shall be limited to such a degree that rats weighing between 40 and 50 Gm. and not exceeding 28 days of age and subsisting on a suitable Vitamin A deficient ration and water for an interval not exceeding 45 days shall manifest symptoms characteristic of Vitamin A deficiency.

Depletion Period—A rat shall be suitable for the depletion period when the age of the rat does not exceed 28 days, and if the body weight of the rat shall exceed 39 Gm., and does not exceed 50 Gm., and if the animal manifests no evidence of injury, or disease, or anatomical abnormality which might hinder growth and development. Throughout the depletion period each rat shall be provided with the Vitamin A test diet and water (U. S. P.), *ad libitum*, and during this period no other dietary supplement shall be available to the animal.

Assembling Rats into Groups for the Assay Period—Rats which are suitable for the assay period shall be assembled into groups. For each assay oil there shall be one or more assay groups. In the assay of one assay oil there shall be provided at least one control group and at least one reference group, but one control group and one reference group may be used for the concurrent assay of more than one assay oil. The interval of assembling rats into groups shall not exceed 60 days. On any one day during the interval of assembling rats into groups, the total number of rats that shall have been assigned to make up any one group shall not exceed by more than two the number of rats that shall have been assigned to make up any other group. When the assembling of all groups shall have been completed, the total number of rats in each group shall be the same, and the number of rats of one sex in each group shall be the same. Not more than three rats from one litter shall be assigned to one group. When the assembling of all groups shall have been completed, the average weight of the rats in any one group on the day beginning the assay period shall not

exceed by more than 10 Gm. the average weight of the rats in any other group on the day beginning the assay period.

Assay Period—A rat shall be suitable for the assay period, provided that the depletion period shall have exceeded 20 days and shall not have exceeded 45 days, and provided that a rat shall manifest evidence of Vitamin A deficiency characterized by declining weight and/or ophthalmia. Throughout the assay period each rat of the control, reference, and assay groups shall be kept in an individual cage and shall be provided with the Vitamin A test diet and water (U. S. P.), *ad libitum*. Throughout the assay period each rat in any assay group shall be fed daily a dose of the assay oil, and throughout the assay period each rat in any one reference group shall be fed daily a dose of the reference oil. The reference oil and/or the assay oil may be diluted before feeding with an edible vegetable oil free from Vitamin A. Diluted oil shall be stored in the dark at a temperature not exceeding 10° C. (50° F.). The period of storage shall not exceed 7 days. Not more than 0.1 cc. of the diluted oil shall be fed as a daily dose. During the assay period all conditions of environment shall be maintained as uniformly as possible with respect to the assay, reference, and control groups.

Recording of Data—On the day beginning the depletion period and at intervals of not more than 7 days for the first 21 days of that period, there shall be a record made of the body weight of each rat. From the twenty-first day of the depletion period until the end of the assay period a record shall be made of the body weight and eye condition of each rat at intervals not exceeding 5 days. The eye condition shall be designated as normal, watery, sensitive to light, swollen, bloody exudate, purulent, opacity of cornea, or any combination of these terms. A record shall be made of the failure of a rat to consume the prescribed daily dose of reference or assay oil.

Vitamin A Potency of the Assay Oil—In determining the Vitamin A potency of the assay oil, the performance of the rats of the assay and reference groups shall be calculated for each group on the basis of the difference between the average weight of the surviving rats and the average weight of the same rats on the day beginning the assay period. The data from the reference group shall be considered valid for establishing the Vitamin A potency of the assay oil only when two-thirds or more of the total number of animals comprising a reference group shall have made individually between the beginning day of the assay period and the twenty-eighth day thereafter an increase in body weight which shall equal or exceed 12 Gm. and shall not exceed 60 Gm., and the data from an assay or reference group shall be considered valid for establishing the Vitamin A potency of the assay oil only when two-thirds or more, but not less than 6, of the rats of an assay or reference group have survived 28 days of the assay period. The data from an assay group shall be considered valid for establishing the Vitamin A potency of an assay oil only when two-thirds or more, but not less than 6 rats, shall have made individually between the beginning day of the assay period and the twenty-eighth day thereafter an increase in body weight which shall equal or exceed 12 Gm. The data from a rat shall be considered valid for establishing the average performance of a reference or assay group only on the condition that the rat has consumed the prescribed dose of oil for at least 22 days of the assay period. A Vitamin A assay shall not be considered valid unless two-thirds or more of the total number of animals comprising the control group shall, prior to the eleventh day of the assay period, manifest symptoms of Vitamin A deficiency characterized by both declining weight and ophthalmia.

Calculation of Vitamin A Potency

Minimum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average gain in weight, G , of not less than 12 Gm. and not more than 60 Gm.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average gain in weight equal to or greater than G .

If the product of $\left(\frac{R}{A}\right) x$ (units per Gm. of Vitamin A contained in the reference oil) is equal to or greater than the minimum standard in U. S. P. units per Gm. for the oil assayed, then the assay oil meets the minimum standard for Vitamin A potency.

Maximum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average gain in weight, G , of not less than 12 Gm. and not more than 60 Gm.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average gain in weight equal to or greater than G .

If the product of $\left(\frac{R}{A}\right) x$ (units per Gm. of Vitamin A contained in the reference oil) is equal to or less than the maximum standard in the U. S. P. units per Gm. for the oil assayed, then the assay oil meets the maximum standard for Vitamin A potency.

Method of Assay for Vitamin D

The Vitamin D assay, comprising the recording of observations of groups of rats, throughout specified periods of their lives, while being maintained on specified dietary regimens, and the interpretation of such data, is as follows:

Preliminary Period—Throughout the preliminary period each rat shall be raised under the immediate supervision of, or according to directions specified by, the assayer. Throughout the preliminary period the rats shall be maintained on a dietary regimen which shall provide for normal development in all respects, except that the supply of Vitamin D shall be limited to such a degree that rats, weighing between 40 and 60 Gm. at an age of 21 to 30 days, and subsisting for an interval of 3 weeks on a suitable rachitogenic diet, shall manifest evidence of severe rickets.

Depletion Period—A rat shall be suitable for the depletion period when the age of the rat does not exceed 30 days, and if the body weight of the rat shall exceed 44 Gm., and does not exceed 60 Gm., and if the animal manifests no evidence of injury, or disease, or anatomical abnormality which might hinder growth and development. Throughout the depletion period each rat shall be provided with the rachitogenic diet and water (U. S. P.), ad libitum, and during this period no other dietary supplement shall be available to the animal.

Assembling Rats into Groups for the Assay Period—Rats which are suitable for the assay period shall be assembled into groups. For each assay oil there shall be one or more assay groups. In the assay of one assay oil there shall be provided at least one reference group, but one reference group may be used for the concurrent assay of more than one assay oil. The interval of assembling rats into groups shall not exceed 60 days. On any one day during the interval of assembling rats into groups,

the total number of rats that shall have been assigned to make up any one group shall not exceed by more than two the number of rats that shall have been assigned to make up any other group. When the assembling of all groups shall have been completed, the total number of rats in each group shall be the same. Not more than three rats from one litter shall be assigned to the assay group unless an equal number of rats from the same litter are assigned to the reference group. When the assembling of all groups shall have been completed, the average weight of the rats in any one group of the day beginning the assay period shall not exceed by more than 8 Gm. the average weight of the rats in any other group on the day beginning the assay period.

Assay Period—A rat shall be suitable for the assay period, provided that the depletion period shall have exceeded 18 days and shall not have exceeded 25 days, and provided that a rat shall manifest evidence of rickets characterized by a distinctive, wobbly, rachitic gait and by enlarged joints. The presence of rickets may also be established by examination of a leg bone of one member of a litter by the "line test" described below. Each rat shall be kept in an individual cage and shall be provided with the rachitogenic diet and water (U. S. P.), ad libitum. On any calendar day of the assay period the assay and reference groups shall receive a rachitogenic diet compounded from the same lots of ingredients. Throughout the first 6 days of the assay period each rat in any one assay group shall be fed daily a dose of the assay oil, and throughout the first 6 days of the assay period each rat in any one reference group shall be fed daily a dose of the reference oil, except that the following deviation from the daily feeding shall be permissible: that the daily dose may be doubled on the day preceding a one-day holiday falling within the first 6 days of the assay period. During the remainder of the assay period neither the assay oil nor the reference oils shall be fed. At the termination of the assay period, each rat shall be killed and one or more leg bones examined for healing of the rachitic metaphysis according to the "line test" described below. The reference oil and/or the assay oil may be diluted before feeding with an edible vegetable oil free from Vitamins A and D. The diluted oil shall be stored in the dark at a temperature not exceeding 10° C. (50° F.), the storage period not to exceed 30 days. Not more than 0.1 cc. of the diluted oil shall be fed as a daily dose. During the assay period all conditions of environment (particularly with reference to physiologically active radiations) shall be maintained as uniformly as possible with respect to the assay and reference groups.

Line Test—The line test shall be made on the proximal end of a tibia or distal end of a radius or ulna. The end of the desired bone is removed from the animal and cleaned of adhering tissue. A longitudinal median section shall be made through the end of the bone with a clean, sharp blade to expose a plane surface through the junction of the epiphysis and diaphysis. In any one assay the same bone of all the animals must be used and sectioned through the same plane. Both sections of the bone shall be rinsed in distilled water and shall then immediately be immersed in a 2 per cent aqueous solution of silver nitrate for 1 minute. The sections shall then be rinsed in distilled water and the sectioned surfaces of the bone shall be exposed in water to daylight or other source of actinic light until the calcified areas have developed a clearly defined stain without marked discoloration of the uncalcified areas.

Records shall be made immediately of the extent and degree of calcification of the rachitic metaphysis of every section. It shall be permissible to use modifications of

the described procedure for staining, provided that such modified procedures clearly differentiate between calcified and uncalcified areas.

Recording of Data—On the day beginning the assay period and on the seventh day thereafter, a record shall be made of the body weight of each rat. A record shall be made of the quantity of rachitogenic diet consumed per rat during the assay period. Numerical values shall be assigned to the extent and degree of calcification of the rachitic metaphysis of the bones examined by the line test so that it will be possible to average the performance of each group.

Vitamin D Potency of the Assay Oil—In determining the Vitamin D potency of the assay oil, the average performance of groups with respect to healing of the rachitic metaphysis shall be considered, provided that the average performance of a reference group with respect to calcification of the rachitic metaphysis shall be determined by the data from rats which individually show an extent and degree of calcification in the rachitic metaphysis as determined by the line test equal to or greater than a condition described as a positive macroscopic evidence of calcification, but less than an extent and degree of calcification described as complete healing. The data from a reference group shall be considered valid for establishing the Vitamin D potency of the assay oil only when two-thirds or more, but not less than seven rats, show individually an extent and degree of calcification of the rachitic metaphysis equal to or greater than a condition described as positive macroscopic evidence of calcification, but less than an extent and degree of calcification described as complete healing. The data from an assay group shall be considered valid for establishing the Vitamin D potency of an assay oil only when two-thirds or more, but not less than seven rats, show individually an extent and degree of calcification of the rachitic metaphysis equal to or greater than a condition described as positive macroscopic evidence of calcification. The data from a rat shall be considered valid for establishing the average performance of a group only on the condition that the weight of the rat at the termination of the assay period, shall equal or exceed the weight of the rat on the beginning day of the assay period and that the rat has consumed 28 Gm. or more of the rachitogenic diet during the assay period and on the condition that the rat has consumed each prescribed dose of assay oil within 24 hours from the time it was fed.

Calculation of Vitamin D Potency

Minimum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average extent and degree of calcification C not less than a condition described as positive macroscopic evidence of calcification but less than an extent and degree of calcification described as complete healing.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average extent and degree of calcification equal to or greater than C .

If the product of $\left(\frac{R}{A}\right) \times$ (units per Gm. of Vitamin D contained in the reference oil) is equal to or greater than the minimum standard in U. S. P. units per Gm. for the oil assay, then the assay oil meets the minimum standard for Vitamin D potency.

Maximum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average extent and degree of calcification C not less than a

condition described as positive macroscopic evidence of calcification but less than an extent and degree of calcification described as complete healing.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average extent and degree of calcification equal to or greater than C .

If the product of $\left(\frac{R}{A}\right)x$ (units per Gm. of Vitamin D contained in the reference oil) is equal to or less than the maximum standard in U. S. P. units per Gm. for the oil assayed then the assay oil meets the maximum standard for Vitamin D potency.

Zinc in Insulin Injection

Transfer from 2 to 10 cc. of Insulin Injection to a centrifuge tube of suitable capacity. Add 1 drop of diluted hydrochloric acid, or sufficient to obtain a clear solution, and 0.5 cc. of 10 per cent (w/v) trichloroacetic acid for each cc. of the preparation used. Mix thoroughly, centrifuge the mixture, and decant the supernatant liquid. Wash the residue with 5 cc. of 4 per cent (w/v) trichloroacetic acid, again centrifuge the mixture, and decant the supernatant liquid. To the combined supernatant liquids in a centrifuge tube, add stronger ammonia T.S., dropwise, until the reaction is alkaline to litmus, then add 1 cc. of ammonium acetate solution, made by dissolving 154 Gm. of ammonium acetate in sufficient distilled water to make 1000 cc.

Stir, and add from 1 to 2 cc. of double-normal acetic acid. Saturate the mixture with hydrogen sulfide, allow to stand over night, and centrifuge. Dissolve the precipitate in approximately 1 cc. of hot diluted hydrochloric acid, transfer the solution quantitatively to a flask, and evaporate to dryness. Introduce 5 cc. of fiftieth-normal sulfuric acid slowly along the side of the warmed flask, and follow with 10 cc. of distilled water and 1 cc. of sodium phosphate solution (made by diluting 50 cc. of reagent phosphoric acid with about 300 cc. of distilled water, then adding such an amount of a 10 per cent solution of sodium hydroxide in distilled water, that when diluted with sufficient distilled water to make 1000 cc., the pH of the solution is not less than 2.8 and not more than 3.2). Boil the liquid for 2 minutes, and allow to cool to room temperature. Add 1 cc. of starch T.S. and 1 cc. of freshly prepared potassium iodide solution, made by dissolving 1 Gm. of potassium iodide in 10 cc. of distilled water. If a blue color appears in the solution within 1 minute, indicating the presence of iodine, add thousandth-normal sodium thiosulfate dropwise, until the solution is colorless. Add 1 cc. of freshly prepared potassium ferricyanide solution, made by dissolving 0.10 Gm. of potassium ferricyanide in 10 cc. of distilled water, stir, and allow to stand for a uniform period of from 1 to 5 minutes. Titrate rapidly the liberated iodine with thousandth-normal sodium thiosulfate until the color changes from deep blue to greenish yellow. The titration is complete when 1 drop of the reagent changes the color of the solution from greenish yellow to yellow. Each cc. of thousandth-normal sodium thiosulfate is equivalent to 0.10 mg. of zinc. Concurrently with the analysis of the sample, apply the same procedure to a suitable volume of standard zinc sulfate solution, made by weighing accurately 0.125 Gm. of zinc oxide, previously gently ignited to constant weight, and dissolving it by warming with 4 cc. of normal sulfuric acid, then diluting with sufficient distilled water to make 1000 cc., each cc. of the solution thus containing 0.10 mg. of zinc (Zn), and make the appropriate correction for incomplete recovery of zinc.

REAGENTS, TEST SOLUTIONS, COLORIMETRIC SOLUTIONS, INDICATORS, VOLUMETRIC APPARATUS, VOLUMETRIC SOLUTIONS, HYDROGEN IONS, AND pH

Reagents are substances used in chemical testing or microscopic examination, either as such or as constituents of test solutions.

Test Solutions, abbreviated "T.S.," are solutions of reagents in such solvents and of such definite concentrations as to make them most suitable for their intended use in qualitative or quantitative analysis.

Indicators are reagents or test solutions used to determine when a certain desired point in a chemical reaction has been obtained.

Volumetric Solutions, also known as "*Standard Solutions*" are solutions of reagents of known concentration intended primarily for use in quantitative determinations. Their concentrations are usually expressed in terms of normality.

Colorimetric Solutions (C.S.) are used in the preparation of colorimetric standards and are employed as a basis of comparison in a number of chemical tests.

Some official substances, complying with the tests for purity given in the monographs of the U. S. P. are satisfactory for use as reagents or test solutions. When a substance is not official, or when a greater degree of purity is required than is provided for in the monograph, the substance will be found in the following list with the necessary description and tests to insure its suitability for the purpose intended.

Reagents, test solutions, volumetric solutions, colorimetric solutions, and indicator solutions should be preserved in containers made of glass of a minimum solubility and alkalinity, and as free from lead and arsenic as practicable. The containers must be capable of being tightly closed. When reagents or test solutions are affected by light, the directions to keep them in light-resistant containers should be carefully observed.

When stoppers made of glass or other materials are used in bottles or other apparatus which are to contain substances capable of attacking or penetrating such surfaces, a protective coating of a thin film of petrolatum may be applied unless other specific directions are given.

Reagent Acids and Ammonia—When hydrochloric, nitric or sulfuric acids, or ammonia, or the diluted acids, or ammonia T.S. are directed to be used in the testing of official substances, or reagents, the reagent grade of these acids and of ammonia is to be used unless otherwise indicated.

Water—When water is mentioned in the tests for reagents or in preparing test solutions, etc., distilled water is always to be used.

Reagents

General Tests for Purity of Reagents

The following general methods of testing are intended to be used in the examination of *Reagents* only, and, except when otherwise directed, they are applied as described below.

Insoluble Matter—The quantity of reagent specified in the test is dissolved in 100 cc. of hot distilled water, unless otherwise directed, in a covered beaker and warmed on a water bath for 1 hour. If any insoluble residue remains, the solution is filtered through counterbalanced filter papers, or through a tared Gooch crucible with an asbestos mat. The filter is washed thoroughly with hot distilled water, dried at from 105° to 110° C., and weighed.

Chloride in Reagents—A solution of the quantity of the reagent indicated in the test in 25 cc. of distilled water, or a solution prepared as directed in the test, is neutralized, if alkaline, with nitric acid, using litmus paper as the indicator, and 3 cc. of nitric acid added. The solution is filtered, if necessary, through a filter paper previously washed with distilled water, and 1 cc. of silver nitrate T.S. added. After mixing well, allow to stand for 5 minutes protected from direct sunlight. The turbidity, if any, is compared with that produced in a control test made with the same quantities of the same reagents as in the final test and a volume of a standard solution of sodium chloride equivalent to the quantity of chloride (Cl) permitted by the test. Both solutions are adjusted to the same volume with distilled water before adding the silver nitrate T.S., and the glass cylinders in which the turbidities are compared must match in internal diameter and in all other respects as closely as possible.

The *standard solution of sodium chloride* is made by dissolving 0.1648 Gm. of sodium chloride in sufficient distilled water to make exactly 1000 cc. It contains the equivalent of 0.10 mg. of chlorine (Cl) in each cc.

In *testing barium salts*, the solution containing the reagent is neutralized, if alkaline, with nitric acid, and only 3 drops more of nitric acid added. The remainder of the test is carried out as described above.

In *testing salts giving colored solutions*, dissolve 2 Gm. of the reagent in 25 cc. of distilled water and add 3 cc. of nitric acid. The solution is filtered, if necessary, through a filter paper previously washed with distilled water, and the filtrate divided into 2 equal portions. One portion is treated with 1 cc. of silver nitrate T.S. and allowed to stand for 10 minutes, and, if any turbidity is produced, it is filtered through a washed filter paper until clear and the filtrate used as a blank. The other portion is treated with 1 cc. of silver nitrate T.S. and, after mixing well and allowing to stand for 5 minutes protected from direct sunlight, the turbidity is compared with that produced in the blank by the addition of a volume of the standard solution of sodium chloride equivalent to the quantity of chloride permitted in the test, both solutions being adjusted to the same volume with distilled water.

Sulfate in Reagents—A solution of the quantity of the reagent indicated in the test in 25 cc. of distilled water, or a solution prepared as directed in the test, is neutralized, if alkaline, with hydrochloric acid, using litmus paper as the indicator, and 1 cc. of normal hydrochloric acid is added. The solution is filtered, if necessary, through a filter paper previously washed with distilled water, and then 2 cc. of

barium chloride T.S. is added. After being well mixed it is allowed to stand for 10 minutes, and the turbidity, if any, is compared with that produced in a control test containing the same quantities of the same reagents used in the test and a quantity of a standard solution of potassium sulfate equivalent to the quantity of sulfate (SO_4) permitted in the test. Both solutions are adjusted to the same volume with distilled water before adding the barium chloride T.S. and the glass cylinders in which the turbidities are compared must match in internal diameter and in all other respects as closely as possible.

The *standard solution of potassium sulfate* is made by dissolving 0.1814 Gm. of potassium sulfate in sufficient distilled water to make 1000 cc. It contains the equivalent of 0.10 mg. of sulfate (SO_4) in each cc.

Heavy Metals in Reagents—Dissolve the quantity of the reagent indicated in the text in 20 to 25 cc. of distilled water, add 2 cc. of diluted acetic acid, then dilute with distilled water to 30 cc. Transfer the solution completely to a Nessler tube or prepare the solution in the tube.

In a Nessler tube closely matching that used for the sample, prepare a control solution with a volume of *standard lead solution*, page 586, equivalent to the limit for heavy metals in the quantity of the reagent directed to be taken for the test, 2 cc. of diluted acetic acid, and sufficient distilled water to make 30 cc. Then to each of the Nessler tubes add 10 cc. of hydrogen sulfide T.S., mix well, and observe the color after 5 minutes. Any color produced in the tube with the reagent is not darker than that with the control, the solutions being viewed downward against a white surface.

When the reagent is an acid salt, or when the solution prepared for the heavy metals test is acid, add 1 or 2 drops of phenolphthalein T.S. to the solution, followed by ammonia T.S. until the solution acquires a slight pink color, then add 2 cc. of diluted acetic acid and dilute with distilled water to 30 cc.

When the reagent is an alkali salt of an organic acid, use 2 cc. of normal hydrochloric acid in the test instead of the diluted acetic acid, unless otherwise specified.

Except when otherwise directed, if using more than 1 cc. of hydrochloric acid or its equivalent of diluted hydrochloric acid, or more than 2 cc. of ammonia T.S. in preparing the sample for the heavy metals test, prepare the control test as follows: evaporate the same quantity of the hydrochloric acid or the ammonia as used in the test with the sample in porcelain or glass to dryness on a steam bath. Add to the residue 2 cc. of diluted acetic acid and a few cc. of warm distilled water, then add the required volume of the standard lead solution and dilute with distilled water to 30 cc.

Iron in Reagents—When a limit for iron is included, it is determined as follows, except when otherwise directed: The solution from the test for *Heavy Metals in Reagents* is filtered, if necessary, and rendered distinctly alkaline to litmus paper by the addition of ammonia T.S. The greenish color produced, if any, is not greater than that produced in a control test made by adding to the blank prepared in the test for *Heavy Metals in Reagents* a quantity of a standard solution of ferric ammonium sulfate equivalent to the quantity of iron permitted in the test, and alkalinized with the same volume of ammonia T.S. as used in the test, both solutions being adjusted to the same volume with distilled water.

The *standard solution of ferric ammonium sulfate* is prepared by dissolving 0.8634

Gm. of ferric ammonium sulfate in distilled water, adding 10 cc. of diluted sulfuric acid and diluting to 1000 cc. It contains the equivalent of 0.10 mg. of iron (Fe) in each cc.

Reagent Standards

The standards for the quality of the reagents described in this Chapter are based upon the degree of purity required for the proper performance of the tests and assays in the Pharmacopœia.

Acetic Acid, CH_3COOH —Use *Acidum Aceticum*, page 12.

Acetic Acid, Diluted—Dilute 60.0 cc. of glacial acetic acid with sufficient distilled water to make 1000 cc.

Non-volatile matter—Evaporate 50 cc. on a steam bath to dryness and dry the residue at 105°C . for 2 hours. The weight of the residue does not exceed 1.0 mg.

Heavy metals—Evaporate 20 cc. in porcelain nearly to dryness on a steam bath. Add to the residue 2 cc. of the acid and dilute with distilled water to 25 cc.; then add 10 cc. of hydrogen sulfide T.S. Any dark color produced is not darker than a control made with 0.04 mg. of Pb and 2 cc. of the diluted acetic acid (2 parts per million).

Chloride, sulfate—Diluted acetic acid, without further dilution, conforms to the tests for *chloride* and *sulfate* given under *Acidum Aceticum*, page 12.

Acetic Acid, Glacial, CH_3COOH —Use *Acidum Aceticum Glaciale*, page 13.

Acetic Anhydride, $(\text{CH}_3\text{CO})_2\text{O}$ —A colorless liquid, possessing a pungent odor. Boils at about 140°C .

Assay—Weigh accurately about 2 Gm. in a 200-cc. glass-stoppered Erlenmeyer flask, cool in ice, add 5 cc. of freshly distilled aniline, immediately stopper, shake vigorously, and allow to stand at room temperature for 30 minutes. Add 50 cc. of ice cold distilled water, pouring it in so as to rinse down the sides of the flask; mix well and titrate with normal alkali, using 3 drops of phenolphthalein T.S. as the indicator. The titration should be carried to a point where the red color persists after standing for 10 minutes.

In a second flask weigh accurately about 2 Gm. of the acetic anhydride, add 50 cc. of distilled water, allow to stand for 30 minutes, and titrate with normal alkali to the same end-point, with phenolphthalein as the indicator. Calculate the number of cubic centimeters of alkali used in each of the titrations to the basis of 1 Gm. of the anhydride. The difference between the 2 calculated titrations, multiplied by 2, is the number of cubic centimeters of normal alkali equivalent to the anhydride in 1 Gm. of the acetic anhydride assayed, and corresponds to not less than 95 per cent of $(\text{CH}_3\text{CO})_2\text{O}$. Each cc. of normal sodium hydroxide is equivalent to 0.05104 Gm. of $(\text{CH}_3\text{CO})_2\text{O}$.

Non-volatile matter—Evaporate 30 cc. on a water bath and dry at from 105° to 110°C . to constant weight: the weight of the residue should not exceed 1.0 mg. (0.003 per cent).

Chloride—The chloride in 5 cc. of acetic anhydride corresponds to not more than 0.025 mg. of Cl (0.0005 per cent), page 645.

Phosphate—Evaporate 10 cc. on a water bath. Dissolve the residue in 10 cc. of

nitric acid and dilute with 50 cc. of distilled water. Nearly neutralize with ammonia T.S., cool slightly, add 50 cc. of ammonium molybdate T.S., shake it at about 40° C. for 5 minutes, and allow to stand for 30 minutes. Any precipitate formed should not be greater than is produced when a quantity of an alkali phosphate, containing 0.1 mg. of phosphate (PO_4), is treated as directed in this test (0.001 per cent PO_4).

Sulfate—To 30 cc. of acetic anhydride add 25 cc. of distilled water and 10 mg. of sodium carbonate; evaporate to dryness on a water bath: the residue shows no more sulfate than corresponds to 0.15 mg. of SO_4 (0.0005 per cent), page 645.

Heavy metals—Dissolve 2.7 cc. (3 Gm.) in 10 cc. of distilled water and evaporate on a steam bath to dryness. Warm the residue with 2 cc. of diluted acetic acid and 10 cc. of water and dilute to 30 cc. The heavy metals limit of acetic anhydride is 5 parts per million, page 646.

Substances reducing permanganate—Dissolve 2 cc. of the anhydride in 10 cc. of distilled water and add 0.4 cc. of tenth-normal potassium permanganate. At the end of 5 minutes the pink color should not be entirely discharged.

Keep in glass-stoppered bottles in a cool, dry place. The stoppers should be sealed with paraffin.

Acetone, CH_3COCH_3 —Use *Acetonum*, page 10.

Acetylcholine Chloride, $\text{CH}_3\text{CO}.\text{OCH}_2\text{CH}_2(\text{CH}_3)_3\text{N}.\text{Cl}$ —White, crystalline, odorless or nearly odorless powder. Very deliquescent. Very soluble in water, freely soluble in alcohol.

Melting point—When thoroughly dried at 110° C. in the capillary tube, it melts between 149° and 152° C.

Reaction—An aqueous solution (1 in 10) is neutral to litmus paper.

Residue on ignition—The residue from 0.2 Gm. is negligible.

Solubility in alcohol—A solution of 0.5 Gm. in 5 cc. of alcohol is complete and colorless.

Per cent acetyl (CH_3CO)—Weigh accurately about 0.4 Gm. of acetylcholine chloride, previously dried at 105° to 110° C. for 3 hours, and dissolve it in an Erlenmeyer flask in 15 cc. of distilled water. Add 40 cc. of tenth-normal sodium hydroxide and heat on a steam bath for 30 minutes. Stopper, allow to cool, and titrate the excess of alkali with tenth-normal sulfuric acid using phenolphthalein T.S. as the indicator. Determine the normality of the tenth-normal sodium hydroxide by titrating 40 cc. after it has been treated in the same manner as in the test. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.004304 Gm. of CH_3CO . It should show not less than 23.2 per cent and not more than 24.2 per cent of CH_3CO .

Per cent chlorine (Cl)—Weigh accurately about 0.4 Gm. of acetylcholine chloride previously dried at 105° to 110° C. and dissolve it in 50 cc. of water in a 100-cc. volumetric flask. Add with agitation 30 cc. of tenth-normal silver nitrate, then add 5 cc. of nitric acid, dilute with distilled water to the 100-cc. mark, and mix well. Filter through a dry filter into a dry flask, rejecting the first 10 cc. of the filtrate. Then titrate 50 cc. of the filtrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 0.003546 Gm. of Cl. It should show not less than 19.3 and not more than 19.8 per cent of Cl.

Alcohol, $\text{C}_2\text{H}_5\text{OH}$ —Use *Alcohol*, page 43.

Alcohol, 90 per cent—Mix 51 cc. of alcohol, page 43, with 3 cc. of distilled water, both measured at 25° C. The specific gravity of the mixture, at 25° C., is 0.827, corresponding to 90 per cent, by volume, of C_2H_5OH .

Alcohol, 80 per cent—Mix 45.5 cc. of alcohol, page 43, with 9.5 cc. of distilled water, both measured at 25° C. The specific gravity of the mixture at 25° C. is 0.857, corresponding to 80 per cent, by volume, of C_2H_5OH .

Alcohol, 70 per cent—Mix 38.6 cc. of alcohol, page 43, with 15 cc. of distilled water, both measured at 25° C. The specific gravity of the mixture at 25° C. is 0.866, corresponding to 70 per cent, by volume, of C_2H_5OH .

Alcohol, Aldehyde-free—Dissolve 2.5 Gm. of lead acetate in 5 cc. of distilled water, add the solution to 1000 cc. of alcohol contained in a glass-stoppered bottle, and mix thoroughly. Dissolve 5 Gm. of potassium hydroxide in 25 cc. of warm alcohol, cool the solution, and add it slowly, without stirring, to the alcoholic solution of lead acetate. After 1 hour shake the mixture vigorously, allow it to stand over night, decant the clear liquid, and recover the alcohol by distillation.

Alcohol, Dehydrated (Absolute Alcohol), C_2H_5OH —Use *Alcohol Dehydratum*, page 44.

Alcohol, Neutralized—To a suitable quantity of alcohol add 2 or 3 drops of phenolphthalein T.S. and just sufficient fiftieth-normal or tenth-normal sodium hydroxide to produce a faint pink color. Neutralized alcohol should be freshly prepared when used.

Aluminum, Metallic, Al—In the form of wire, granules, or sheets. Soluble in diluted sulfuric or in hydrochloric acid and in solutions of fixed alkali hydroxides.

Arsenic—Place 0.75 Gm. of aluminum in the generator bottle, page 554, omitting the pledget of cotton. Add 10 cc. of water and 10 cc. of 30 per cent sodium hydroxide solution and allow the reaction to proceed for 30 minutes: not more than a barely perceptible stain is produced on the mercuric bromide paper.

p-Aminoacetophenone, $H_2N.C_6H_4.CO.CH_3$ —Pale yellow crystals or crystalline powder. Characteristic odor. Slightly soluble in cold water, soluble in hot water, and in alcohol; also soluble in diluted hydrochloric acid.

Melting point—Between 104° and 106° C.

Completeness of solution—A solution of 0.5 Gm. in 10 cc. of alcohol or in 10 cc. of diluted hydrochloric acid is complete and clear.

Residue on ignition—The residue from 0.2 Gm. is negligible.

Ammonia Water, Stronger, Reagent (Ammonium Hydroxide)—An aqueous solution of ammonia (NH_3), containing not less than 27 per cent by weight of NH_3 .

Mix the stronger ammonia water in the original container and pour 10 cc. into a test tube (150 mm. by 20 mm.), and compare with distilled water in a similar tube. The liquids should be equally clear and free from suspended matter, and, viewed across the columns by transmitted light, there should be no apparent difference in color between two liquids.

Assay—Tare a small, glass-stoppered Erlenmeyer flask containing 15 cc. of distilled water. Quickly add about 2 cc. of the ammonia water, stopper, reweigh, and

then titrate with normal acid, using methyl red T.S. as the indicator. Each cc. of normal acid is equivalent to 0.01703 Gm. of NH_3 . It shows not less than 27 per cent of NH_3 .

Non-volatile matter—Evaporate 45 cc. of the ammonia water to dryness, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 2.0 mg. (about 0.005 per cent).

Carbon dioxide—To 10 cc. of the ammonia water add 10 cc. of water (free from carbon dioxide) and 5 cc. of barium hydroxide T.S. The turbidity should not be greater than is produced when the same quantity of barium hydroxide solution is added to 20 cc. of distilled water (free from carbon dioxide), containing 0.5 mg. of sodium carbonate (0.002 per cent).

Chloride—To 20 cc. of the ammonia water add 10.0 mg. of sodium carbonate and evaporate to dryness. The residue dissolved in 25 cc. of distilled water shows no more chloride than corresponds to 0.01 mg. of Cl (0.00005 per cent), page 645.

Pyridine—Dilute 25 cc. of the ammonia water with 25 cc. of distilled water and nearly neutralize with dilute sulfuric acid (1 in 4), using methyl orange T.S. as the indicator. Stir briskly and note the odor. Not more than a very faint odor of pyridine should be obtained.

Total sulfur—To 40 cc. of the ammonia water add 20 mg. of sodium carbonate and evaporate to a volume of 5 cc. Add 3 drops of bromine T.S. and evaporate to dryness. Add to the residue a slight excess of diluted hydrochloric acid and again evaporate to dryness. This residue, dissolved in 25 cc. of distilled water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.0003 per cent), page 645.

Heavy metals—Dilute 10 cc. of the ammonia water to 40 cc. with distilled water and add 10 cc. of hydrogen sulfide T.S.: no brown color should be observed. Any green color should not be greater than is obtained by adding 10 cc. of hydrogen sulfide T.S. to 40 cc. of an ammoniacal solution containing 0.01 mg. of iron (about 2 parts per million heavy metals, about 1 part per million Fe).

Substances reducing permanganate—Dilute 3 cc. of the ammonia water with 5 cc. of distilled water and add 50 cc. of approximately double-normal sulfuric acid. Add 1 drop of tenth-normal potassium permanganate, heat to boiling, and keep at this temperature for 5 minutes: the pink color should not be entirely discharged.

Ammonium Acetate, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ —Colorless crystals or crystalline masses, usually having a slight acetous odor. Very soluble in water or alcohol. It is very deliquescent. Keep in tight containers.

Assay—Weigh accurately about 1.5 Gm. of ammonium acetate and transfer it completely with the aid of distilled water to a 300-cc. Erlenmeyer flask. Add sufficient distilled water to make about 100 cc., then add exactly 40 cc. of normal sodium hydroxide and boil gently until the vapors no longer turn red litmus paper blue. Cool and titrate the excess of sodium hydroxide with normal sulfuric acid, using phenolphthalein T.S. as the indicator. Perform a blank test with the same volume of normal sodium hydroxide and distilled water and in the same manner, and make any necessary correction. Each cc. of normal sulfuric acid is equivalent to 0.07708 Gm. of $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$. Not less than 97 per cent and not more than 101 per cent of $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ should be found.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 645.

Residue on ignition—Not more than 0.01 per cent.

Chloride—The chloride from 2 Gm. corresponds to not more than 0.01 mg. of Cl (0.0005 per cent), page 645.

Nitrate—Dissolve 3 Gm. in 8 cc. of distilled water. Add 1 drop of diluted hydrochloric acid, 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid. The blue color is not completely discharged in 5 minutes (about 0.002 per cent NO_3).

Phosphate—Evaporate 10 Gm. with 15 cc. of nitric acid to dryness on a steam bath. Add to the residue 10 cc. of nitric acid, dilute with 50 cc. of distilled water, and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° C. for 5 minutes, and allow to stand $\frac{1}{2}$ hour. Any yellow precipitate formed is not more than is produced in a control made in the same manner as the test and with a quantity of anhydrous sodium phosphate equivalent to 0.03 mg. of PO_4 (0.0003 per cent PO_4).

Sulfate—Dissolve 5 Gm. in 100 cc. of distilled water, add 1 cc. of diluted hydrochloric acid, heat to boiling, and add 5 cc. of barium chloride T.S. No turbidity or precipitate is produced in 4 hours (about 0.003 per cent SO_4).

Heavy metals—The heavy metals limit for Ammonium Acetate is 5 parts per million, using 3 Gm. for the test, and acidulating the solution with 2 cc. of normal hydrochloric acid.

Ammonium Carbonate, $\text{NH}_4\text{HCO}_3 \cdot \text{NH}_2 \cdot \text{COO} \cdot \text{NH}_4$ —Use *Ammonii Carbonas*, page 52.

Ammonium Chloride, NH_4Cl —Colorless crystals, or a white, granular powder.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 645.

Residue on ignition—To 10 Gm. of the ammonium chloride in an 80-cc. porcelain or silica dish add 2 cc. of reagent sulfuric acid and heat at a temperature which will require at least 1 hour to volatilize the salt. Ignite at low red heat for 5 minutes, cool, and weigh. The weight of the residue should not exceed 1.5 mg. (0.015 per cent).

Neutrality—Dissolve 5 Gm. in 50 cc. of freshly boiled and cooled distilled water and add 1 drop of methyl red T.S. If a red color is produced, not more than 0.10 cc. of tenth-normal alkali should be required to discharge it.

Phosphate—Evaporate 10 Gm. with 15 cc. of nitric acid to dryness on a water bath. Dissolve the residue in 10 cc. of nitric acid, dilute with 50 cc. of distilled water, and nearly neutralize with ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the solution at about 40° C. for 5 minutes, and allow to stand for 30 minutes. Any precipitate formed should not be greater than is produced when a quantity of an alkaline phosphate, containing 0.03 mg. of phosphate (PO_4), is treated according to the above procedure (0.0003 per cent PO_4).

Sulfate—Dissolve 2 Gm. in 20 cc. of distilled water, add 1 cc. of normal hydrochloric acid, heat to boiling, add 2 cc. of barium chloride T.S., and allow to stand over night: no turbidity or precipitate is produced.

Calcium and magnesium precipitate—Warm the residue obtained in the determination of the residue on ignition with 1 cc. of reagent hydrochloric acid and 3 cc. of distilled water. Add 5 cc. of ammonia T.S., filter, add to the filtrate 2 cc. of ammonium oxalate T.S. and 2 cc. of ammonium phosphate T.S., and allow to stand over night. If any precipitate is formed, filter, and wash the precipitate with a 2.5 per

cent solution of ammonia. The weight of the ignited precipitate should not be more than 1.0 mg. (0.005 per cent).

Heavy metals—The heavy metals limit for Ammonium Chloride is 5 parts per million, using 3 Gm. for the test, page 646.

Iron—The iron in 3 Gm. corresponds to not more than 0.015 mg. of Fe (0.0005 per cent), page 646.

Ammonium Citrate, Dibasic, $(\text{NH}_4)_2\text{HC}_6\text{H}_5\text{O}_7$ —Colorless crystals or white granules. Very soluble in water, slightly soluble in alcohol.

Assay for ammonia—Weigh accurately about 1.5 Gm. and dissolve it in 150 cc. of distilled water in a long-necked flask connected by means of a trap with a well-cooled condenser and a receiver, the end of which dips under the surface of exactly 50 cc. of half-normal sulfuric acid. Quickly add to the flask 20 cc. of 10 per cent sodium hydroxide solution, and distil, collecting about 120 cc. of distillate; then titrate the excess acid with half-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of half-normal sulfuric acid is equivalent to 0.008515 Gm. of NH_3 . Not less than 14.7 per cent and not more than 15.5 per cent of NH_3 should be found.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent).

Residue on ignition—The sulfated ash from 2 Gm. is not more than 1.0 mg. (about 0.05 per cent).

Chloride—The chloride from 2 Gm. corresponds to not more than 0.02 mg. of Cl (0.001 per cent).

Phosphate—Dissolve 5 Gm. in 50 cc. of distilled water, add 5 cc. of nitric acid and boil for 5 minutes. Nearly neutralize the solution with ammonia T.S., then add 25 cc. of ammonium molybdate solution, shake for 5 minutes at about 40°C ., and allow to stand for 30 minutes. Any precipitate formed is not greater than is produced when a quantity of potassium biphosphate, equivalent to 0.05 mg. of PO_4 , is treated in the same manner.

Sulfate—Mix 2 Gm. with 0.5 Gm. of sodium carbonate and ignite gently until thoroughly charred, protecting from sulfur in the flame. Add to the residue 10 cc. of distilled water and 5 cc. of bromine water and boil gently for 3 minutes, then add 2 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Treat the residue with 10 cc. of hot distilled water, filter, and wash with distilled water to make the filtrate measure 25 cc. Add to the filtrate 0.5 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. If a turbidity is produced it is not greater than that in a control made as follows: dissolve 0.5 Gm. of sodium carbonate in 10 cc. of distilled water, add 5 cc. of bromine water, 2 cc. of hydrochloric acid, and follow with a quantity of the standard potassium sulfate solution equivalent to 0.2 mg. of SO_4 . Evaporate to dryness, then treat the residue in the same manner as in the test (0.01 per cent SO_4).

Heavy metals—Dissolve 3 Gm. in 15 cc. of distilled water, add a drop of phenolphthalein T.S., then add ammonia T.S. until a slight pink color is produced. Add 2 cc. of normal hydrochloric acid, dilute with distilled water to 30 cc., and add 10 cc. of hydrogen sulfide T.S. Any dark color produced is not darker than that in a control containing in 30 cc. of distilled water 0.015 mg. of Pb and 1 cc. of tenth-normal hydrochloric acid (5 parts per million).

Iron—Dissolve 1 Gm. in 15 cc. of distilled water, add 5 drops of nitric acid, boil for 1 minute, and cool. Dilute with distilled water to 25 cc. and add 2 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S. Any red color produced is not darker than in a control made with 0.01 mg. of Fe (10 parts per million).

Ammonium Nitrate, NH_4NO_3 —Colorless crystals or white granules, very soluble in water, slightly soluble in alcohol.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 645.

Residue on ignition—Heat 10 Gm. gently until the salt is volatilized and ignite for 5 minutes at cherry redness: the residue should not weigh more than 1.0 mg. (0.01 per cent).

Neutrality—Dissolve 5 Gm. in 50 cc. of freshly boiled and cooled water and add 1 drop of methyl red T.S. If a red color is produced, it requires not more than 0.10 cc. of tenth-normal alkali to discharge it.

Chloride—The chloride in 2 Gm. corresponds to not more than 0.01 mg. of Cl, (0.0005 per cent), page 645.

Nitrite—Dissolve 1 Gm. in 10 cc. of distilled water, add 1 cc. of dilute sulfuric acid (1 volume of reagent sulfuric acid with distilled water to make 10 volumes) and 1 cc. of colorless metaphenylenediamine hydrochloride T.S. No yellowish or brownish color should be produced in 5 minutes (about 0.0005 per cent NO_2).

(NOTE—Metaphenylenediamine hydrochloride solution can be decolorized by treating with a little activated charcoal.)

Phosphate—Dissolve 25 Gm. in 50 cc. of distilled water, add 0.5 cc. of nitric acid and 50 cc. of ammonium molybdate T.S. Shake the solution at about 40° C. for 5 minutes and allow to stand for 30 minutes. Any precipitate formed is not more than is produced when a quantity of an alkaline phosphate, containing 0.10 mg. of phosphate (PO_4) and 5 Gm. of the ammonium nitrate, is treated according to the above procedure (0.0005 per cent PO_4).

Sulfate—Dissolve 5 Gm. in 10 cc. of warm distilled water, add 1 Gm. of sodium carbonate, mix well, evaporate and ignite gently until no more volatilizes. Add to the residue 5 cc. of water and 3 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Dissolve the residue in 1 cc. of normal hydrochloric acid and sufficient distilled water to make 25 cc. Filter and add to the filtrate 2 cc. of barium chloride T.S.: any resulting turbidity is not greater than in a blank to which 0.1 mg. of SO_4 has been added.

Heavy metals—The heavy metals limit for ammonium nitrate is 5 parts per million, using 2 Gm. for the test, page 646.

Iron—The iron from 2 Gm. corresponds to not more than 0.004 mg. of Fe (2 parts per million), page 646.

Ammonium Oxalate, $(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ —Colorless crystals, soluble in water.

Insoluble—The insoluble matter from 10 Gm., using 200 cc. of hot distilled water for solution, is not more than 1.0 mg. (0.01 per cent), page 645.

Residue on ignition—Ignite 5 Gm. at the lowest possible temperature for volatilization: the residue should not weigh more than 1.0 mg. (0.02 per cent).

Chloride—Dissolve 2 Gm. in 50 cc. of distilled water, add 10 cc. of nitric acid, and 1 cc. of silver nitrate T.S. The turbidity should not be greater than that pro-

duced by 0.04 mg. of chloride ion in 50 cc. of distilled water when the same quantities of nitric acid and silver nitrate are added (0.002 per cent Cl).

Sulfate—Dissolve 2 Gm. of ammonium oxalate and about 1 Gm. of sodium carbonate in 20 cc. of hot distilled water, evaporate to dryness in a porcelain crucible, and gently ignite the residue with a sulfur-free flame until no more fumes are evolved. Cool, add 10 cc. of distilled water and 1 cc. of bromine T.S., and heat on a water bath for 15 minutes. Add 3 cc. of hydrochloric acid and evaporate to dryness on a water bath: the residue, dissolved in 25 cc. of distilled water, shows no more sulfate than a blank to which 0.12 mg. of SO_4 has been added (0.006 per cent).

Heavy metals—To the residue from the test for *residue on ignition* add 1 cc. of hydrochloric acid and 5 drops of nitric acid, evaporate to dryness on a steam bath, and dissolve the residue in 25 cc. of distilled water. Use 10 cc. of the solution for testing for heavy metals. The heavy metals limit for ammonium oxalate is 10 parts per million.

Iron—Dilute 10 cc. of the solution from the preceding test to 25 cc. with distilled water, add 2 cc. of hydrochloric acid and 2 cc. of ammonium cyanate T.S.: any red color produced is not darker than that produced by 0.010 mg. of Fe (0.0005 per cent).

Ammonium Phosphate, Dibasic (*Diammonium Hydrogen Phosphate*), $(\text{NH}_4)_2\text{HPO}_4$ —White crystals or granules, very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg., page 645.

Reaction to phenolphthalein—A solution of 1 Gm. in 10 cc. of distilled water should be colored pink by the addition of 0.15 cc. of phenolphthalein T.S.

Chloride—The chloride in 2 Gm. corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 645.

Nitrate—Mix 3 Gm. with 2 cc. of distilled water containing 5 mg. of sodium chloride. Add 0.1 cc. of indigo carmine solution T.S. and 10 cc. of reagent sulfuric acid, and stir until all of the phosphate is in solution. The blue color should not be completely discharged in 5 minutes (about 0.002 per cent NO_3).

Sulfur compounds—Dissolve 10 Gm. in about 80 cc. of distilled water, add 2 cc. of bromine T.S., heat to boiling, and add 12 cc. of reagent hydrochloric acid. Boil, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, filter and wash until the washings cease to react with silver nitrate T.S., ignite, and weigh. The weight of the precipitate, after correcting by a complete blank determination on the reagents, including filtration, should not be more than 1.0 mg. (0.004 per cent SO_4).

Alkali salts—Dissolve 3 Gm. in 100 cc. of distilled water and add a solution of 15 Gm. of lead acetate in 50 cc. of distilled water. Filter, measure out 100 cc. of the filtrate and precipitate the excess of lead with hydrogen sulfide. Filter without washing, evaporate the filtrate to dryness, ignite gently, and weigh. The weight of the residue should not be more than 2.0 mg. (not more than 0.1 per cent). A correction must be made for possible alkali salts in the lead acetate by evaporating the residue from a solution of 10 Gm. of lead acetate from which the lead has been precipitated with hydrogen sulfide. If a weighable residue is obtained in the blank, it must be further corrected for substances precipitated by ammonium phosphate.

Arsenic—Test 2 Gm. for arsenic as outlined on page 554. The stain produced corresponds to not more than 0.004 mg. of As (0.0002 per cent).

Heavy metals—Dissolve 5 Gm. in 40 cc. of distilled water, add 40 cc. of normal

sulfuric acid and 5 cc. of hydrogen sulfide T.S., and dilute to 100 cc. Any brown color which is immediately developed should not be greater than is produced by 0.05 mg. of lead in the same volume of an aqueous solution of a lead salt treated with the same amount of hydrogen sulfide T.S. (10 parts per million).

Iron—Dissolve 5.5 Gm. in sufficient distilled water to make 100 cc. Dilute 10 cc. of this solution to 40 cc., and add 1 cc. of ammonia T.S. and 5 cc. of freshly prepared hydrogen sulfide T.S. Any color produced is not greater than is produced in a standard containing 1 cc. of the solution of the sample, 0.005 mg. of iron, and the same quantities of reagents in the same volume (10 parts per million).

Ammonium Sulfate, $(\text{NH}_4)_2\text{SO}_4$ —Colorless crystals or white granules. Very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 645.

Residue on ignition—To 10 Gm. of the ammonium sulfate in an 80-cc. dish add 1 cc. of sulfuric acid and heat at a temperature that will require at least 1 hour to volatilize the salt. Ignite at low red heat for 5 minutes, cool, and weigh. The weight of the residue should not exceed 1.5 mg. (0.015 per cent).

Neutrality—Dissolve 5 Gm. in 50 cc. of carbon dioxide-free distilled water and add 1 drop of methyl red T.S. If a red color is produced, not more than 0.10 cc. of tenth-normal alkali should be required to change the red color to yellow.

Chloride—The chloride in 2 Gm. corresponds to not more than 0.01 mg. of Cl (0.0005 per cent), page 645.

Nitrate—Dissolve 3 Gm. in 8 cc. of distilled water containing about 10 mg. of sodium chloride. Add 0.1 cc. of indigo carmine T.S. and 10 cc. of reagent sulfuric acid. The blue color is not completely discharged in 5 minutes (about 0.002 per cent NO_3).

Phosphate—Dissolve 5 Gm. in 50 cc. of distilled water, add 10 cc. of nitric acid, nearly neutralize with ammonia T.S., and add 50 cc. of ammonium molybdate T.S. Shake the solution for 5 minutes at about 40° C. and allow to stand for 1 hour. Any precipitate produced should not be greater than is produced when a quantity of an alkaline phosphate containing 0.025 mg. of PO_4 is treated according to the above procedure (0.0005 per cent PO_4).

Arsenic—Test 1 Gm. by the method outlined on page 554. The stain produced corresponds to not more than 0.005 mg. of As (0.0005 per cent).

Heavy metals—The heavy metals limit for ammonium sulfate is 5 parts per million, using 3 Gm. for the test, page 646.

Iron—The iron from 3 Gm. corresponds to not more than 0.015 mg. of Fe (5 parts per million), page 646.

Ammonium Thiocyanate, NH_4SCN —Colorless, deliquescent crystals. Very soluble in water, soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Residue on ignition—Ignite 4 Gm. at the lowest possible temperature: the residue should not weigh more than 1.0 mg. (0.025 per cent).

Chloride—To a solution of 4 Gm. of reagent cupric sulfate in 20 cc. of distilled water add 30 cc. of a saturated solution of sulfur dioxide and 1 Gm. of the thiocyanate dissolved in 10 cc. of distilled water. Boil for about 1 minute, cool quickly,

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and filter. Add 10 cc. of the sulfur dioxide solution to the filtrate. If additional precipitation takes place, filter and add more sulfur dioxide to the filtrate. To the clear filtrate add 5 cc. of nitric acid and 0.5 cc. of silver nitrate T.S. The turbidity should not be greater than is produced in the same volume of distilled water, containing 0.20 mg. of chloride ion, the quantity of sulfur dioxide used in the test, enough reagent cupric sulfate to match the color of the test solution, and the quantities of nitric acid and silver nitrate used in the test (0.02 per cent Cl).

Sulfate—The sulfate in 2 Gm. corresponds to not more than 0.1 mg. SO_4 (0.005 per cent), page 645.

Heavy metals—The heavy metals limit for Ammonium Thiocyanate is 5 parts per million, using 3 Gm. for the test, page 646.

Amyl Alcohol (Isoamyl Alcohol), $\text{C}_5\text{H}_{11}\text{OH}$ —Colorless, oily liquid. Characteristic, penetrating odor. Specific gravity: about 0.81 at 25°C . Miscible with alcohol, ether, chloroform, carbon disulfide, purified benzin, benzene, and with fixed and volatile oils. Slightly soluble in water.

Boiling range—Determine by method II on page 559, using 50 cc. All of it should distil between 128° and 132°C .

Non-volatile matter—Evaporate 40 cc. on a water bath and dry to constant weight at 110°C .: the weight of the residue should not exceed 1.0 mg. (0.003 per cent).

Acids and esters—Dilute 20 cc. with 20 cc. of alcohol, add 5 cc. of tenth-normal sodium hydroxide, and heat gently under a reflux condenser for 10 minutes. Cool, add 3 drops of phenolphthalein T.S., and titrate the excess of sodium hydroxide with tenth-normal hydrochloric acid. Not more than 0.75 cc. of the tenth-normal sodium hydroxide should have been consumed, correction being made for the amount consumed in a blank test (0.06 per cent, as amyl acetate).

Aldehydes—Shake 5 cc. with 5 cc. of potassium hydroxide solution (30 Gm. in 100 cc.) for 5 minutes in a glass-stoppered cylinder, and allow to separate: no color should develop in either layer.

Substances darkened by sulfuric acid—Cool 10 cc. of the alcohol and 10 cc. of reagent sulfuric acid to 10°C ., mix, and shake the mixture for 5 minutes: not more than a light brown color appears.

Aniline, $\text{C}_6\text{H}_5\text{NH}_2$ —A colorless or pale yellow liquid. Specific gravity: 1.02 at 25°C . Sparingly soluble in water, miscible with alcohol or with ether.

Boiling range—On distilling 100 cc. of aniline by method II described on page 560, not less than 95 cc. distils between 183° and 186°C .

Non-volatile matter—Evaporate 20 cc. and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.005 per cent).

Hydrocarbons and nitrobenzene—Mix 5 cc. with 10 cc. of reagent hydrochloric acid. The solution while still hot from the mixing should be clear and should remain clear after diluting with 15 cc. of cold distilled water.

Aniline Blue—A certified, water-soluble dye consisting of a mixture of the trisulfonates of tri-phenyl pararosanilin and of diphenylrosanilin.

Aniline Sulfate, $(\text{C}_6\text{H}_5\text{NH}_2)_2 \cdot \text{H}_2\text{SO}_4$ —White, or nearly white crystals or a crystalline powder: very soluble in water, slightly soluble in alcohol, insoluble in ether.

Insoluble—A solution of 1 Gm. in 50 cc. of distilled water is colorless and clear, or nearly so.

Residue on ignition—Cautiously ignite 2 Gm. to constant weight: the weight of the residue is not more than 2.0 mg. (0.1 per cent).

Chloride—Dissolve 0.25 Gm. in a mixture of 18 cc. of distilled water and 2 cc. of nitric acid, and add 1 cc. of silver nitrate T.S.: no turbidity is produced in 15 seconds.

Heavy metals—The heavy metals limit for aniline sulfate is 20 parts per million, using 1 Gm. for the test, page 646.

Arsenic Trioxide, As₂O₃—A white powder or irregular masses.

Non-volatile matter—Ignite 5 Gm. in a platinum dish under a hood to constant weight: the weight of the residue should not exceed 1.0 mg. (0.02 per cent).

Insoluble in ammonia water—Heat 5 Gm. with 50 cc. of ammonia water (1 in 3) in an Erlenmeyer flask connected with a reflux condenser until the arsenic is dissolved. Filter through asbestos in a Gooch crucible, wash with warm dilute ammonia T.S., and dry at 110° C. to constant weight. The weight of the insoluble residue does not exceed 0.5 mg. (0.01 per cent).

Chloride—Dissolve 1 Gm. in 10 cc. of warm dilute ammonia water (1 in 3), cool, and add an excess of diluted nitric acid and 2 cc. of silver nitrate T.S. The turbidity, if any, is not greater than that produced by 0.05 mg. of chloride in an equal volume of solution containing the same quantities of the same reagents used in the test (0.005 per cent of Cl).

Sulfide—Dissolve 1 Gm. in 10 cc. of sodium hydroxide T.S. and add 1 drop of lead acetate T.S. The color should be the same as that of an equal volume of the sodium hydroxide solution to which only the lead acetate is added (about 0.001 per cent of S).

Antimony and other hydrogen sulfide metals—Dissolve 1 Gm. in 10 cc. of reagent hydrochloric acid and 10 cc. of distilled water, and evaporate to dryness. Dissolve the residue in 2 cc. of reagent hydrochloric acid and 2 cc. of distilled water, and evaporate again. Dissolve the residue in 1 cc. of reagent hydrochloric acid, dilute to 10 cc. with distilled water, neutralize with ammonia T.S., and add 1 cc. of normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no color is produced (about 20 parts per million of Sb or about 10 parts per million of Pb).

Iron—Dissolve 1 Gm. in 5 cc. of reagent hydrochloric acid, dilute to 20 cc. with distilled water, and add bromine T.S., a little at a time, until the bromine color is permanent. Boil off the excess of bromine, dilute to 20 cc. with distilled water, cool, and add 2 cc. of ammonium thiocyanate T.S. Any red color is not greater than that produced by 0.005 mg. of Fe in the same volume of solution with the same quantities of the same reagents used in the test and similarly treated (5 parts per million).

Asbestos—The silky, well-matted variety of long fiber, amphibole asbestos. Digest with diluted hydrochloric acid for 24 hours and wash with distilled water until free of acid. Then digest for 24 hours with sodium hydroxide T.S. Wash until free of alkali, digest for 3 hours with diluted nitric acid, and finally wash with distilled water until free of acid and shake with distilled water to a fine pulp.

Azolitmin—A water-soluble coloring matter obtained from litmus; in dark, violet

scales; soluble with difficulty in water, more easily soluble in hot water; insoluble in alcohol or dilute acid; very soluble in dilute alkalis, forming deep blue solutions.

Dissolve 1 Gm. of azolitmin in 80 cc. of hot distilled water and add 20 cc. of alcohol to the solution. Add 0.1 cc. of this solution to 50 cc. of distilled water (free from carbon dioxide). The bluish red color of the liquid is changed to red by the addition of 0.05 cc. of tenth-normal hydrochloric acid; or it is changed to bluish violet by the addition of 0.05 cc. of tenth-normal sodium hydroxide.

Barium Chloride, $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ —Colorless crystals, readily soluble in water, slightly soluble in alcohol and in hydrochloric acid.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Nitrate and chlorate—Dissolve 2 Gm. in 20 cc. of distilled water, add 1 cc. of reagent sulfuric acid to precipitate the barium, and filter. Superimpose 10 cc. of the filtrate upon 10 cc. of diphenylamine solution (0.5 Gm. in 100 cc. of reagent sulfuric acid and 20 cc. of distilled water). No blue ring should develop between the two solutions within 20 minutes (about 0.005 per cent as NO_3).

Calcium and alkali salts—Dissolve 5 Gm. in 150 cc. of distilled water, add 1 cc. of reagent hydrochloric acid and heat to boiling. Add 25 cc. of dilute sulfuric acid (1 volume of reagent acid and distilled water to make 15 volumes), cool, make up to 250 cc. with distilled water, and allow to stand over night. Decant through a filter, evaporate 100 cc. of the filtrate to dryness and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent as sulfates).

Strontium and calcium chlorides—Add 20 cc. of dehydrated alcohol to 2 Gm. of the finely powdered barium chloride. Allow to stand for 30 minutes with occasional shaking. Filter, evaporate the filtrate, and ignite gently to constant weight: the weight of the residue should not exceed 2.0 mg. (0.10 per cent).

Heavy metals—The heavy metals limit for barium chloride is 5 parts per million, using 2 Gm. for the test, page 646.

Iron—The iron in 2 Gm. corresponds to not more than 0.006 mg. of Fe (3 parts per million), page 646.

Barium Hydroxide, $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ —Colorless crystals, soluble in water.

Assay and carbonate—Weigh accurately about 5 Gm. of clear crystals and dissolve in about 200 cc. of carbon dioxide-free distilled water. Titrate with normal hydrochloric acid, using phenolphthalein T.S. as the indicator, until the pink color is destroyed. Each cc. of normal acid is equivalent to 0.1578 Gm. of $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$. The volume of the acid consumed corresponds to not less than 97 per cent of $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$. Continue the titration with methyl orange T.S. until the solution is colored slightly pink. Each cc. of normal acid is equivalent to 0.09869 Gm. of BaCO_3 . The additional volume of acid corresponds to not more than 3 per cent of barium carbonate.

Insoluble in hydrochloric acid—Dissolve 10 Gm. in 100 cc. of distilled water and 10 cc. of reagent hydrochloric acid. Heat on a water bath for 1 hour, filter through asbestos in a Gooch crucible, wash thoroughly, and dry to constant weight at from 105° to 110° C. The weight of the residue should not exceed 1.0 mg. (0.01 per cent).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.02 mg. of Cl (0.002 per cent), page 645.

Sulfide—Dissolve 1 Gm. in 8 cc. of warm distilled water, add 5 drops of alkaline

lead solution (made by adding sodium hydroxide to lead acetate T.S. until the precipitate is redissolved), then add 2 cc. of glacial acetic acid: no darkening should be produced (about 0.001 per cent S).

Calcium and alkali salts—Dissolve 5 Gm. in 150 cc. of hot distilled water and 5 cc. of reagent hydrochloric acid. Heat to boiling and add 25 cc. of dilute sulfuric acid (1 volume of reagent acid and distilled water to make 15 volumes). Allow to cool, make up to 250 cc. with distilled water, and allow to stand over night. Decant 100 cc. through a filter, evaporate to dryness, and ignite to constant weight: the weight of the residue is not more than 4.0 mg. (0.20 per cent as sulfate).

Heavy metals—Mix 2 Gm. with 20 cc. of distilled water and cautiously add hydrochloric acid until no more dissolves and the solution is slightly acid to litmus. Evaporate to dryness in glass or porcelain on a steam bath. Test the residue for heavy metals as described in the test for *Heavy metals in reagents*, page 646. The heavy metals limit for Barium Hydroxide is 10 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (3 parts per million), page 646.

Barium Nitrate, $\text{Ba}(\text{NO}_3)_2$ —Colorless crystals, soluble in water, practically insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm., dissolved in 150 cc. of hot water, weighs not more than 1.0 mg. (0.01 per cent), page 645.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.005 mg. of Cl (0.0005 per cent), page 645.

Calcium and alkali salts—Determine the calcium and alkali salts as directed under *barium chloride*, page 658. The weight of the residue does not exceed 1.0 mg. (0.05 per cent as sulfate).

Calcium and strontium salts—Dissolve 2 Gm. in 15 cc. of hot distilled water, add 10 cc. of reagent hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 10 cc. of hot distilled water, add 10 cc. of reagent hydrochloric acid, evaporate to dryness again, and dry in the oven at 105°C . Grind the residue to a fine powder, and treat with 20 cc. of dehydrated alcohol. Allow to stand for 30 minutes with occasional shaking, filter, evaporate the filtrate, ignite gently, and weigh. The weight of the residue does not exceed 0.0020 Gm. (0.10 per cent as chlorides).

Heavy metals—The heavy metals limit for barium nitrate is 5 parts per million, using 2 Gm. for the test, page 646.

Iron—The iron in 2 Gm. corresponds to not more than 0.006 mg. of Fe (3 parts per million), page 646.

Benzene, C_6H_6 —A colorless, transparent, inflammable liquid, having a characteristic, agreeable aromatic odor. Specific gravity: about 0.876 at 25°C . Insoluble in water; miscible with alcohol and with ether.

Boiling range—Determine by method II as described on page 559. Not less than 95 cc. distills between 79.5° and 81°C .

Congealing temperature—When tested according to the method described on page 566, the temperature of congealation should not be below 5.2°C .

Non-volatile matter—Evaporate 115 cc. on a water bath and dry at from 105° to 110°C . for 30 minutes. The weight of the residue does not exceed 1.0 mg. (about 0.001 per cent).

Water—Place 10 cc. in a test tube (150×16 mm.) loosely stoppered. Pack in cracked ice. No turbidity should be observed at the end of 3 minutes (about 0.02 per cent).

Sulfur compounds—Place 30 cc. of alcoholic potassium hydroxide T.S. in an Erlenmeyer flask, add 6 cc. of the benzene, and boil the mixture gently for 30 minutes under a reflux condenser. Detach the condenser, dilute with 50 cc. of distilled water, and heat on a water bath until the benzene and alcohol are evaporated. Add 50 cc. of bromine T.S. and heat for 15 minutes longer. Transfer the solution to a beaker, neutralize with dilute hydrochloric acid (1 in 5), add an excess of 1 cc. of the acid, and concentrate to about 50 cc. Filter if necessary, heat the filtrate to boiling and add 5 cc. of barium chloride T.S., heat on a water bath for 2 hours, and allow to stand over night. If a precipitate is formed, filter through a small filter paper, wash with distilled water until the washings no longer react with silver nitrate T.S., and ignite. The weight of the barium sulfate is not more than 2.0 mg. after correcting for a blank on the same quantities of the same reagents used in the test, including filtration and ignition, even if no precipitate is visible (about 0.005 per cent as S).

Substances darkened by sulfuric acid—Shake 25 cc. with 15 cc. of reagent sulfuric acid for from 15 to 20 seconds and allow to separate. Neither the benzene nor the acid is darkened.

Thiophene—Add a few milligrams of isatin to the mixture of benzene and sulfuric acid from the preceding test, shake well, and allow to stand for 1 hour: the acid layer should not acquire a blue or green color.

Benzidine (*Paradiaminodiphenyl*), $(C_6H_4NH_2)_2$ —A white or slightly reddish crystalline powder. Very slightly soluble in water, in alcohol and in ether.

Melting range—It melts between 127° and 129° C.

Residue on ignition—Cautiously ignite 2 Gm. to constant weight: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Solution in dilute hydrochloric acid—Add 1 Gm. to a mixture of 50 cc. of distilled water and 5 cc. of reagent hydrochloric acid: complete or nearly complete solution results.

Sulfate—To the filtered solution obtained in the preceding test add 1 cc. of barium chloride T.S.: no turbidity or precipitate should appear within 30 minutes.

Benzin, Purified—Use *Benzinum Purificatum*, page 83.

Betanaphthol, $C_{10}H_7OH$ —Use *Betanaphthol*, page 85.

Blood (for carbon monoxide test in gases)—For this purpose use *oxalated* or *defibrinated blood* of dogs, sheep, cattle, or human beings within 24 hours after bleeding. Prepare *oxalated blood* by adding 10 mg. of neutral potassium oxalate to each cc. of blood, immediately when drawn.

Boric Acid, H_3BO_3 —Use *Acidum Boricum*, page 18.

Bromine, Br—A dark reddish brown, fuming, corrosive liquid. Sparingly soluble in water, soluble in alcohol or in ether with gradual decomposition of the solvents.

Specific gravity (limit of *chlorine*)—Shake 6 volumes of the bromine with 1 volume of distilled water. The specific gravity at $25^\circ/25^\circ$ C. of the bromine saturated with water is not less than 3.099, corresponding to not more than about 0.3 per cent of chlorine.

Non-volatile matter—Volatilize 5 cc. in a weighed porcelain dish on a steam bath: the weight of the residue should not exceed 2.5 mg. (0.015 per cent).

Organic bromine compounds—Add 1 cc. of bromine to 25 cc. of 10 per cent sodium hydroxide solution, dilute with an equal volume of distilled water, and allow to stand over night: no oily drops or film should separate.

Iodine—Shake 1 cc. with 50 cc. of distilled water and about 3 Gm. of granulated zinc until all of the bromine is reduced. Filter, add to the filtrate 1 cc. of ferric chloride T.S. and 5 cc. of chloroform, and shake it well. No pink or violet color should appear (about 0.05 per cent I).

Sulfur compounds—Weigh about 5 cc. of the bromine, add 1 cc. of nitric acid, allow to stand for 30 minutes, and evaporate to dryness on a water bath. Add a few drops of hydrochloric acid and evaporate again to dryness. The residue dissolved in 25 cc. of hot distilled water shows no more sulfate than corresponds to 0.006 per cent of SO_4 (0.002 per cent of S), page 645.

*Butyl Alcohol, Normal (*n*-Butanol)*, $\text{CH}_3(\text{CH}_2)_2\text{CH}_2\text{OH}$ —A clear, colorless liquid having a characteristic odor; miscible with dehydrated alcohol and with ether.

Specific gravity—About 0.81 at 25° C.

Boiling range—When distilled by method II, as directed on page 559, not less than 95 per cent of it should distil between 115° and 118° C.

Solution in alcohol or ether—Mix 5 cc. with 25 cc. of dehydrated alcohol: a clear solution results. When mixed with 5 times its volume of ether, the solution is also clear.

Non-volatile matter—Evaporate 10 cc. on a water bath and dry at 100° C. for 30 minutes: not more than 1.5 mg. of residue remains (0.02 per cent).

Free acid—Mix 10 cc. with 25 cc. of neutral dehydrated alcohol, add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide: not more than 0.2 cc. of the tenth-normal sodium hydroxide is required to produce a pink color (0.02 per cent, as butyric acid).

Calcium Biphosphate (Calcium Phosphate Monobasic), $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$ —White, somewhat deliquescent crystals, or crystalline powder. Sparingly soluble in water; insoluble in alcohol.

Insoluble in hydrochloric acid—Heat 10 Gm. with a mixture of 90 cc. of distilled water and 10 cc. of hydrochloric acid until dissolved. Filter any undissolved residue, wash it well with distilled water, and dry at 105° C. Its weight does not exceed 2.0 mg. (0.02 per cent).

Dibasic salt or excess acid—Triturate 1 Gm. with 3 cc. of distilled water, then dilute with 100 cc. of distilled water, and add 1 drop of methyl orange T.S. A red color is produced (*absence of dibasic salt*), which is changed to yellow by not more than 1 cc. of normal sodium hydroxide (*excess acid*).

Chloride—Dissolve 1 Gm. in 30 cc. of distilled water and 2 cc. of nitric acid, filter if necessary, and add 1 cc. of silver nitrate T.S. Any resulting turbidity corresponds to not more than 0.05 mg. of Cl (0.005 per cent).

Nitrate—Mix 0.5 Gm. with 5 cc. of distilled water and add just sufficient hydrochloric acid to dissolve. Dilute with distilled water to 10 cc., add 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid. The blue color persists for 1 minute.

Sulfate—Heat 5 Gm. with a mixture of 5 cc. of hydrochloric acid and 100 cc. of

distilled water until dissolved, and filter. Heat the filtrate to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. Filter any precipitate if present, wash it with hot distilled water, and ignite. The weight of the precipitate does not exceed 10 mg. (about 0.08 per cent SO_4).

Ammonia—To 1 Gm. add 10 cc. of hot distilled water and just sufficient hydrochloric acid to dissolve, then dilute with distilled water to 30 cc., and add 20 cc. of 10 per cent sodium hydroxide solution. Filter, and to 25 cc. of the filtrate add 1 cc. of Nessler's solution. The resulting color is not darker than that of a control made with 0.05 mg. of NH_3 , and 10 cc. of the sodium hydroxide solution in the same final volume as the sample (0.01 per cent).

Arsenic—Test 0.2 Gm. for arsenic as described on page 554. The stain produced corresponds to not more than 0.002 mg. of As (0.001 per cent).

Barium—Heat 1 Gm. with 10 cc. of distilled water and add hydrochloric acid dropwise, stirring after each addition until just dissolved. Filter and add to the filtrate 5 cc. of calcium sulfate T.S. No turbidity is produced in 1 hour.

Heavy metals—Heat 2 Gm. with 20 cc. of distilled water and add hydrochloric acid dropwise, stirring after each addition until dissolved. Dilute with distilled water to 40 cc., and to 20 cc. of the dilution add 5 cc. of hydrogen sulfide T.S. The solution is not darkened.

Calcium Carbonate, CaCO_3 —Use *Calcii Carbonas Præcipitatus*, page 94.

Calcium Chloride, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ —White, small crystals; very soluble in water, soluble in alcohol.

Assay—Weigh accurately about 2 Gm., dissolve in distilled water, and make up with distilled water to 200 cc. Transfer 25 cc. to a 200-cc. graduated flask, dilute with about 100 cc. of distilled water, add 2 cc. of nitric acid, and slowly add 50 cc. of silver nitrate T.S. Add distilled water to make 200 cc., shake the mixture well, and filter it through a dry filter into a dry flask, rejecting the first part of the filtrate. Titrate the excess of silver nitrate in 100 cc. of the filtrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 0.007352 Gm. of $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$. The volume of tenth-normal silver nitrate consumed indicates not less than 74 per cent of CaCl_2 .

Insoluble and ammonium hydroxide precipitate—Dissolve 10 Gm. in 100 cc. of distilled water and heat to boiling. Render slightly alkaline with ammonia T.S. (free from carbonate) and boil for 5 minutes. If a precipitate is formed, filter through a small paper and wash with a little hot distilled water. Reserve the filtrate for the test for sulfate. Redissolve the precipitate with hot dilute hydrochloric acid (1 in 3), boil the solution (which should amount to about 20 cc.) for 1 or 2 minutes, and make slightly alkaline with ammonia T.S. Filter through the same paper as before, wash thoroughly and ignite to constant weight: the weight of the ignited residue should not exceed 1.5 mg. (0.015 per cent).

Acidity—Dissolve 2 Gm. in 20 cc. of distilled water free from carbon dioxide and add 2 drops of phenolphthalein T.S. A pink color should be produced on the addition of 1 drop of tenth-normal sodium hydroxide solution.

Alkalinity—Dissolve 5 Gm. in 50 cc. of distilled water free from carbon dioxide and add 2 drops of phenolphthalein T.S. If any pink color is produced, it should be discharged by not more than 0.3 cc. of tenth-normal hydrochloric acid (0.02 per cent as $\text{Ca}(\text{OH})_2$).

Nitrate—Dissolve 2 Gm. in 10 cc. of distilled water, add 0.1 cc. of indigo carmine T.S., and add, with stirring, 10 cc. of reagent sulfuric acid. The blue color should not be entirely discharged in 10 minutes (about 0.003 per cent NO_3).

Sulfate—Neutralize with reagent hydrochloric acid the filtrate from the test for *insoluble and ammonium hydroxide precipitate*, and add an excess of 1 cc. of the acid. Heat to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, proceed as described for sulfur compounds under *Ammonium Phosphate Dibasic*, page 654, beginning with "filter." The weight of the barium sulfate is not greater than 2.5 mg. (0.01 per cent SO_4).

Ammonia—Dissolve 2 Gm. in 45 cc. of distilled water and add 15 cc. of 10 per cent sodium hydroxide solution. Filter, and to 30 cc. of the filtrate add 2 cc. of Nessler's reagent. Any color developed is not more intense than that in a blank test made with 0.05 mg. of NH_3 (0.005 per cent).

Barium—Dissolve 2 Gm. in 15 cc. of distilled water, add 2 Gm. of sodium acetate and 1 drop of glacial acetic acid, filter if necessary, and add 3 cc. of potassium dichromate T.S. At the end of 15 minutes the solution should show no turbidity when compared in a 50-cc. Nessler tube with a similar tube containing only distilled water and dichromate solution in the same quantities as in the test (about 0.005 per cent Ba).

Magnesium and alkali salts—To 2 Gm. of the calcium chloride in 100 cc. of distilled water add 5 cc. of hydrochloric acid, heat to boiling and add 100 cc. of a 4 per cent oxalic acid solution. Slowly neutralize with ammonia T.S. over a period of about 30 minutes while the solution is cooling. Dilute with distilled water to 250 cc., allow to stand for 4 hours, and filter. To 125 cc. of the filtrate add 10 drops of reagent sulfuric acid, evaporate to dryness, and ignite gently to constant weight. The weight of the residue does not exceed 5.0 mg. (0.50 per cent as sulfate).

Heavy metals—The heavy metals limit for calcium chloride is 10 parts per million, using 2 Gm. for the test, page 646.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 646.

Calcium Chloride Anhydrous, CaCl_2 —Deliquescent lumps or porous masses.

Assay—Assay by the method given under *Calcium Chloride*, page 662. It shows not less than 94 per cent of CaCl_2 .

Magnesium and alkali salt—Determine by the method given under the preceding reagent. The residue does not exceed 2 per cent.

Calcium Oxide, see *Lime*, page 686.

Calcium Sulfate, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ —White powder or pulverulent masses. Soluble in about 400 parts of water, insoluble in alcohol.

Insoluble in hydrochloric acid—Dissolve with the aid of heat 1 Gm. of calcium sulfate in a mixture of 50 cc. of distilled water and 10 cc. of reagent hydrochloric acid. If an insoluble residue remains, filter, wash until free of sulfate, and ignite to constant weight: the weight of the residue does not exceed 1.0 mg. (0.1 per cent).

Chloride—Agitate 0.5 Gm. of calcium sulfate for 5 minutes with a mixture of 20 cc. of distilled water and 5 cc. of nitric acid and filter. The filtrate, without further acidulation, shows no more chloride than corresponds to 0.075 mg. of Cl (0.015 per cent), page 645.

Magnesium and alkali salts—To the filtrate obtained in the test for *insoluble in hydrochloric acid*, add an excess of ammonium oxalate T.S., heat to boiling, and add sufficient ammonia T.S. to render the solution distinctly alkaline. Dilute the solution, after cooling, to 150 cc., mix well, allow to stand over night, and filter. Evaporate 75 cc. of the filtrate to dryness and ignite to constant weight: the weight of the residue should not exceed 3.0 mg. (0.6 per cent).

Heavy metals—Boil 1 Gm. of the salt for 5 minutes with a mixture of 20 cc. of distilled water and 2 cc. of hydrochloric acid. Cool, neutralize with ammonia T.S., add 1 cc. of normal hydrochloric acid, filter if necessary, and add to the filtrate 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Canada Turpentine—A liquid oleoresin from *Abies balsamea* (Linné) Miller (Fam. *Pinacæ*). A pale yellow or greenish, transparent liquid. Very soluble in ether, in chloroform, or in benzene.

When exposed to air, it slowly dries and remains transparent.

Canada turpentine solidifies when mixed with 20 per cent of its weight of magnesium oxide, previously moistened with water.

Carbon Disulfide, CS₂—A clear, colorless, volatile, and inflammable liquid. It is odorless when fresh, but on standing in contact with air it acquires a yellow color and a disagreeable odor. This change is accelerated by exposure to light. It is very slightly soluble in water, very soluble in alcohol, in chloroform, and in ether.

Specific gravity—About 1.26 at 25° C.

Boiling range—Distil 100 cc. by method II given on page 559: not less than 95 cc. should distil between 46° and 47° C.

Non-volatile matter—Evaporate 40 cc. at from 50° to 60° C.; the residue should not have a disagreeable odor. Dry for 1 hour at 60° C. and weigh. The weight of the residue should not exceed 1.0 mg. (0.002 per cent).

Water—Cool 10 cc. in a test tube to 0° C.: no turbidity or drops of water appear.

Foreign sulfides and dissolved sulfur—Shake 2 cc. in a dry test tube with a globule of mercury for 2 minutes; the mercury may discolor slightly but retains a bright color.

Sulfite and sulfate—Shake 10 cc. with 10 cc. of distilled water in a separator for 5 minutes; separate and discard the carbon disulfide. To the aqueous layer add 1 drop of tenth-normal iodine. A yellow or violet color should be produced. Add to the solution 1 cc. of barium chloride T.S.: no turbidity should be produced in 15 minutes (about 0.002 per cent as SO₂).

Keep in tightly stoppered bottles, protected from light and in a cool place.

Carbon Tetrachloride, CCl₄—A clear, colorless liquid.

Specific gravity—1.588 to 1.590 at 25° C.

Boiling range—Distil 100 cc. by method II, page 559: not less than 95 per cent distils between 76° and 78° C.

Non-volatile matter—Evaporate 60 cc. on a water bath and dry at 105° to 110° C. for 30 minutes: the weight of the residue does not exceed 1.0 mg. (0.001 per cent).

Acid—Shake 15 cc. with 25 cc. of distilled water (carbon dioxide free) for 5 minutes, separate and reject the carbon tetrachloride. Add to 10 cc. of the aqueous layer 2 drops of phenolphthalein T.S. and 0.05 cc. of tenth-normal sodium hydroxide: a pink color is produced.

Aldehyde—Shake 10 cc. with 10 cc. of distilled water containing 0.05 cc. of tenth-normal potassium permanganate: the color does not disappear in 5 minutes.

Chloride ion—To 10 cc. of the aqueous layer obtained in the test for *acid* add 2 drops of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than is produced by 0.02 mg. of chloride ion in 10 cc. of distilled water in the same quantities of acid and silver nitrate used in the test (0.0002 per cent).

Free chlorine—Shake 10 cc. for 2 minutes with 10 cc. of distilled water to which 2 drops of potassium iodide T.S. have been added and allow to separate: the lower layer does not show a violet tint.

Iodine-consuming substances—To 25 cc. add 1 drop of tenth-normal iodine and shake well: the violet color remains at the end of 30 minutes.

Sulfur compounds—Determine as described under *Benzene*, page 659, using 3 cc. of carbon tetrachloride. The weight of the barium sulfate is not greater than 2.0 mg. (0.005 per cent as S).

Substances darkened by sulfuric acid—Shake 20 cc. with 5 cc. of sulfuric acid for 5 minutes in a glass-stoppered cylinder which has been rinsed with the sulfuric acid. After the layers have separated, the sulfuric acid shows not more than a slight yellow color.

Casein—A white or slightly yellow, odorless, granular powder. Insoluble in water and other neutral solvents, but readily dissolved by ammonia T.S. and by solutions of alkali hydroxides, usually forming a cloudy solution.

Residue on ignition—Ignite 2 Gm., slowly at first, to constant weight: the residue does not exceed 20.0 mg. (1 per cent).

Loss at 100° C.—Dry 2 Gm. at 100° C. to constant weight: the loss in weight does not exceed 0.20 Gm. (10 per cent).

Alkalinity—Shake 1 Gm. of casein with 20 cc. of distilled water for 10 minutes and filter: the filtrate is not alkaline to red litmus paper.

Soluble substances—When the filtrate from the *alkalinity* test is evaporated and dried at 100° C., the residue does not exceed 1.0 mg. (0.10 per cent).

Fats—Dissolve 1 Gm. of casein in 10 cc. of distilled water and 5 cc. of alcoholic ammonia T.S. and shake out with 2 successive portions of 20 cc. each of purified petroleum benzin. Evaporate the benzin at a low temperature and dry at 70° C.: the residue should not exceed 5.0 mg. (0.50 per cent).

Nitrogen—When determined by the *Kjeldahl* method, page 598, from 15.2 to 16 per cent of nitrogen should be found.

Ceric Sulfate, $\text{Ce}(\text{SO}_4)_2$ with a variable amount of water. It also contains sulfates of the other associated earths.

Yellow to orange yellow crystals or crystalline powder. Almost insoluble in cold water; slowly soluble in cold dilute mineral acids, more readily soluble when heated with these solvents.

Assay—Weigh accurately about 0.8 Gm. of the ceric sulfate, transfer to a flask, add 25 cc. of distilled water and 3 cc. of sulfuric acid, and warm until dissolved. Cool, add 60 cc. of a mixture of 1 volume of phosphoric acid and 20 volumes of distilled water. Add 25 cc. of 10 per cent potassium iodide solution, stopper the flask, and allow to stand for 15 minutes; then titrate the liberated iodine with tenth-normal sodium thiosulfate in an atmosphere of carbon dioxide, using starch as an indicator toward the end. One cc. of tenth-normal sodium thiosulfate is equivalent

to 0.03323 Gm. of $\text{Ce}(\text{SO}_4)_2$. The assay should show not less than 80 per cent of $\text{Ce}(\text{SO}_4)_2$.

Chloride—Dissolve 1 Gm. of ceric sulfate in a mixture of 5 cc. of nitric acid and 45 cc. of distilled water. Filter if not clear, and divide into 2 equal portions. To one portion add 1 cc. of silver nitrate T.S., allow to stand for 10 minutes, filter until clear, and use for the control. To the other portion add 1 cc. of silver nitrate T.S.: the resulting turbidity in the second portion is not greater than that produced by adding 0.05 mg. of Cl to the control (0.01 per cent).

Heavy metals—Heat 0.5 Gm. with a mixture of 10 cc. of distilled water and 0.5 cc. of sulfuric acid until dissolved. Cool, dilute with distilled water to 50 cc., and saturate with hydrogen sulfide: a precipitate of sulfur forms which is white or not darker than pale yellow.

Iron—Dissolve 0.1 Gm. of ceric sulfate in a mixture of 5 cc. of distilled water and 2 cc. of hydrochloric acid, warming if necessary, and cool. Dilute with distilled water to 25 cc. in a stoppered cylinder, add 5 cc. of ammonium thiocyanate T.S. and 25 cc. of ether. Shake gently, but well, and allow to separate. The pink color in the ether layer is not darker than that produced by diluting a quantity of standard iron solution containing 0.20 mg. of Fe with 2 cc. of hydrochloric acid and sufficient distilled water to measure 25 cc., then treating this solution with ammonium thiocyanate and ether in the same manner as the ceric sulfate solution.

Charcoal—Use *Carbo Activatus*, page 117.

Chloral Hydrate, $\text{CCl}_3\text{CHO} \cdot \text{H}_2\text{O}$ —Use *Chloralis Hydras*, page 127.

Chloranil (*Tetrachlorobenzoquinone*), $\text{C}_6\text{Cl}_4\text{O}_2$ —Golden yellow leaflets. Insoluble in water, slightly soluble in alcohol, soluble in ether. It dissolves in sodium hydroxide solutions forming a violet red solution.

Melting point—When determined in a sealed tube in a bath preheated to 270°C ., it melts at about 295°C .

Residue on ignition—(sulfated)—Not more than 0.2 per cent.

Chlorinated Lime—A white or grayish white powder, having the odor of chlorine. It rapidly decomposes on exposure to air. It is partially soluble in water and in alcohol.

Assay—Transfer to a mortar, about 4 Gm. of Chlorinated Lime, accurately weighed in a tared weighing bottle, using 50 cc. of distilled water. Triturate thoroughly, and pour the mixture into a 1000-cc. graduated flask, rinsing the mortar with distilled water to make 1000 cc. Stopper the flask, and allow it to stand for 10 minutes. Shake thoroughly, add to 100 cc. of the mixture 1 Gm. of potassium iodide and 5 cc. of acetic acid, and titrate the liberated iodine with tenth-normal sodium thiosulfate, starch T.S. being used as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.003547 Gm. of available chlorine (Cl). It shows not less than 30 per cent of available chlorine.

Preserve in air-tight containers in a cool, dry place.

Chloroform, CHCl_3 —Use *Chloroformum*, page 130.

Chromium Trioxide, CrO_3 —Use *Chromii Trioxidum*, page 135.

Chromotropic Acid (*1,8-Dihydroxynaphthalene-3,6-disulfonic Acid*), $\text{C}_{10}\text{H}_6\text{O}_8\text{S}_2 \cdot 2\text{H}_2\text{O}$ —White to brownish powder; soluble in water. It is usually available as its

disodium salt, $\text{C}_{10}\text{H}_6\text{O}_3\text{S}_2\text{Na}_2$, which is yellow to light brown in color, and freely soluble in water. The addition of some sodium hydroxide to 5 cc. of the aqueous solution (1 in 500) produces a violet red color. The addition of 1 drop of ferric chloride T.S. to a solution of 1 mg. in 10 cc. of distilled water produces a grass green color.

Sensitiveness—Dilute exactly 0.5 cc. of solution of formaldehyde with distilled water to make 1000 cc. Dissolve 5 mg. of Chromotropic Acid, or its sodium salt, in 10 cc. of a mixture of 9 cc. of sulfuric acid and 4 cc. of distilled water. Add 5 cc. of this solution to 0.2 cc. of the formaldehyde dilution and heat for 10 minutes at 60°C .: a violet color is produced.

Cobaltous Acetate (*Cobalt Acetate*), $\text{Co}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 4\text{H}_2\text{O}$ —Red, needle-like crystals, soluble in water or in alcohol.

Insoluble—Use 5 Gm. and dissolve it in 100 cc. of distilled water containing 2 cc. of glacial acetic acid: the insoluble residue weighs not more than 1.0 mg. (0.02 per cent), page 645.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.1 mg. of Cl (0.01 per cent), page 645.

Nitrate—Dissolve 0.5 Gm. in 10 cc. of distilled water and add, with stirring, 10 cc. of sodium hydroxide T.S. and heat on a water bath for 30 minutes. Cool, dilute to 20 cc., mix well, and filter. To 10 cc. of the filtrate add 5 mg. of sodium chloride, 2 drops of indigo carmine T.S., and 10 cc. of reagent sulfuric acid. The blue color should not entirely disappear in 1 minute (about 0.05 per cent NO_3).

Sulfate—Heat the filtrate from the insoluble matter, exclusive of the washings, to boiling, add 5 cc. of barium chloride T.S. and allow to stand over night. If a precipitate is present, proceed as described under the determination of sulfur compounds in *Ammonium Phosphate, Dibasic*, page 654. The weight of the barium sulfate is not greater than 2.5 mg. (0.02 per cent SO_4).

Alkali and earths—Dissolve 2 Gm. in about 90 cc. of distilled water, add 2 Gm. of ammonium chloride, and sufficient ammonia T.S. to redissolve the precipitate first formed. Pass hydrogen sulfide into this solution until the cobalt is completely precipitated. Add sufficient water to make the total volume 100 cc., mix well, and filter. Evaporate 50 cc. of the filtrate nearly to dryness, add 0.5 cc. of concentrated sulfuric acid, and ignite to constant weight. The weight of the residue should not exceed 3.0 mg. (0.30 per cent).

Copper—Solution A—Dissolve 0.5 Gm. in 30 cc. of distilled water and add 1 cc. of reagent hydrochloric acid. Solution B—Dissolve another 0.5 Gm. in 20 cc. of distilled water, add 1 cc. of reagent hydrochloric acid and 10 cc. of hydrogen sulfide T.S. No change in color should be noticeable when compared with solution A.

Nickel—Dissolve 1 Gm. in 200 cc. of distilled water, add 1 Gm. of sodium citrate, heat to boiling, add 100 cc. of 1 per cent alcoholic solution of dimethylglyoxime, follow with 15 cc. of ammonia T.S., and allow to stand over night. Filter through asbestos in a weighed Gooch crucible, wash with distilled water, then with 50 per cent alcohol, and dry to constant weight at 105°C .: the weight of the precipitate does not exceed 25.0 mg. (0.50 per cent Ni).

Cobaltous Chloride (*Cobalt Chloride*), $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ —Red crystals or a red crystalline powder. Very soluble in water and in alcohol; soluble in acetone and in glycerin.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Nitrate—Dissolve 1 Gm. of cobalt chloride in 10 cc. of distilled water, add, with stirring, 10 cc. of 10 per cent sodium hydroxide solution and heat on a water bath for 30 minutes. Cool, dilute to 20 cc., mix well, and filter. To 10 cc. of the filtrate add 0.1 cc. of indigo carmine T.S. and 10 cc. of reagent sulfuric acid. The blue color should not entirely disappear in 5 minutes (about 0.01 per cent NO_3).

Sulfate—Determine the sulfate in the filtrate from the test for insoluble matter, exclusive of the washings, as described under *Cobaltous Acetate*, page 667. The weight of the barium sulfate does not exceed 5 mg. (0.02 per cent SO_4).

Alkali and earths—Determine as described under *Cobaltous Acetate*, page 667: the weight of the residue should not exceed 3.0 mg. (0.30 per cent as sulfates).

Copper—Solution A—Dissolve 1 Gm. of the cobalt chloride in 30 cc. of distilled water and add 0.5 cc. of reagent hydrochloric acid. Solution B—Dissolve 1 Gm. of cobalt chloride in 20 cc. of distilled water, add 0.5 cc. of reagent hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no change in color should be noticeable when compared with solution A.

Iron—Dissolve 1 Gm. in 20 cc. of distilled water, boil with 1 cc. of nitric acid, then add 1 Gm. of ammonium chloride and sufficient ammonia T.S. to dissolve the precipitate first formed. Filter and wash thoroughly. Drop on the filter 5 cc. of hot dilute hydrochloric acid (1 and 2) and wash with hot distilled water until the filtrate and washing measure about 45 cc. Cool and add 5 cc. of ammonium thiocyanate T.S., dilute to 50 cc., and mix thoroughly. Any red color should not be greater than that in a control test made with the same volume of distilled water and hydrochloric acid to which has been added 0.05 mg. of ferric iron (50 parts per million).

Nickel—Determine the nickel as described under *Cobaltous Acetate*, page 667: the weight of the precipitate is not greater than 10.0 mg. (0.20 per cent).

Congo Red (*Sodium diphenyl-diazo-bis-alphanaphthylamine-4-sulfonate*), ($\text{C}_6\text{H}_4\text{N}:\text{NC}_{10}\text{H}_5\text{NH}_2\text{SO}_3\text{Na}$)₂—A brownish red powder, slightly soluble in cold water or in alcohol; soluble in hot water forming a deep red solution. pH range: 3.0—blue; 5.0—red.

Sensitiveness—Dissolve 0.1 Gm. in 18 cc. of distilled water and 2 cc. of alcohol and add 3 drops of this solution to 100 cc. of carbon dioxide-free water. The red color is changed to violet by 0.1 cc. of tenth-normal hydrochloric acid and is restored on the subsequent addition of 0.1 cc. of tenth-normal sodium hydroxide.

Copper, Cu—Copper in the form of wire, foil, turnings, filings, or granules. Insoluble in hydrochloric acid; soluble in nitric acid or in hot sulfuric acid.

Antimony and tin—Dissolve 5 Gm. of copper in a mixture of 20 cc. of nitric acid and 10 cc. of distilled water and evaporate to dryness on a water bath. Dissolve the residue in about 50 cc. of diluted nitric acid; no insoluble residue remains.

Lead—To 10 cc. of the nitric acid solution obtained in the test for antimony and tin add 2 cc. of sulfuric acid and evaporate to dense white fumes of sulfur trioxide, then cautiously dilute with distilled water to about 20 cc.: no insoluble residue remains.

Silver—To a second 10-cc. portion of the above nitric acid solution add 1 cc. of diluted hydrochloric acid: no turbidity is produced.

Cotton, Non-absorbent—The hairs of the seed of cultivated varieties of *Gossypium*

herbaceum Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*), freed from adhering impurities and linters, and sterilized.

Cupric Acetate, $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$ —Bluish green crystals or powder having an acetous odor. Soluble in water, slightly soluble in alcohol.

Insoluble—Use 10 Gm. and dissolve it in 100 cc. of distilled water containing 1 cc. of glacial acetic acid; the weight of the insoluble residue is not greater than 1.0 mg. (0.01 per cent), page 645.

Chloride—The chloride from 1 Gm. corresponds to not more than 0.03 mg. of Cl (0.003 per cent), page 645.

Sulfate—To the filtrate from the test for insoluble matter add 5 cc. of glacial acetic acid. Heat to boiling; add 5 cc. of barium chloride T.S. and proceed as directed under *Ammonium Phosphate, Dibasic*, page 654. The weight of the barium sulfate obtained is not more than 2.5 mg. (0.01 per cent SO_4).

Substances not precipitated by hydrogen sulfide—Dissolve 5 Gm. in about 200 cc. of distilled water, add 2 cc. of sulfuric acid, heat to about 70°C ., and pass in hydrogen sulfide gas until the copper is completely precipitated. Dilute with distilled water to 250 cc. and filter without washing. Evaporate 200 cc. of the filtrate to dryness, ignite, and weigh the residue: the weight of the residue should not exceed 5 mg. (0.20 per cent).

Iron—Warm the residue obtained from the preceding test with 1 cc. of reagent hydrochloric acid and 2 drops of nitric acid, and dilute to 20 cc. with distilled water. Dilute 5 cc. of this solution with 15 cc. of distilled water and add 2 cc. of reagent hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color is not greater than is produced in a blank with 0.1 mg. of Fe (100 parts per million).

Metals, other than iron, precipitated by ammonium sulfide—To 10 cc. of the solution of the residue add a slight excess of ammonia T.S., boil for 1 minute, filter, and wash with a small quantity of hot distilled water. Dilute the filtrate and washings to 25 cc. Exactly neutralize 5 cc. of the filtrate and washings with diluted hydrochloric acid and dilute to 20 cc. Add 2 drops of ammonia T.S. and 1 cc. of hydrogen sulfide T.S. The solution should not be darker than a standard solution prepared in the same way and containing 0.04 mg. of Ni (100 parts per million).

Cupric Sulfate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ —Deep blue, triclinic crystals or a blue powder.

Insoluble—Dissolve 10 Gm. in 100 cc. of distilled water containing 3 cc. of sulfuric acid: the insoluble residue weighs not more than 1.0 mg. (0.01 per cent).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.01 mg. of Cl (0.001 per cent), page 645.

Substances not precipitated by hydrogen sulfide—Determine as described under *Cupric Acetate*, see above: the residue weighs not more than 4.0 mg. (0.1 per cent).

Ammonium hydroxide precipitate—Treat the residue from the preceding test with 2 cc. of hydrochloric acid and a few drops of nitric acid, and evaporate almost to dryness. Dissolve in a mixture of 10 drops of hydrochloric acid and 10 cc. of distilled water, filter if necessary, and wash the filter paper with a few cc. of distilled water. Add to the filtrate a slight excess of ammonia T.S. and heat for 2 minutes. If a precipitate is formed, filter through a small filter paper, wash with small quantities of distilled water, ignite, and weigh: the ignited residue should not weigh more than 0.4 mg. (about 0.01 per cent).

Metals, other than iron, precipitated by ammonium sulfide—Dilute the filtrate and

washings obtained in the previous test to 100 cc. with distilled water. Exactly neutralize 10 cc. with diluted hydrochloric acid and dilute to 20 cc. Add 0.1 cc. of ammonia T.S. and 1 cc. of hydrogen sulfide T.S. The solution should not be darker than a standard prepared in the same way and containing 0.04 mg. of Ni (100 parts per million).

Cupric Sulfate, Anhydrous, CuSO_4 —A white or grayish white powder free from a blue tinge. Upon the addition of a small quantity of distilled water, it becomes blue. It is soluble in water.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.02 mg. of Cl (0.002 per cent), page 645.

Substances not precipitated by hydrogen sulfide—Proceed as described under *Cupric Acetate*, page 669. The residue should not weigh more than 4.5 mg. (0.15 per cent). Keep in well-stoppered bottles.

Curare—The composition of curare is not definitely known. Different specimens vary, depending upon the variety of plant used in its manufacture. The most important source of curare is the bark of several varieties of *Strychnos*, the species most commonly employed being *S. Castelnæi* Wedd., *S. toxifera* Benth., or *S. Crevauxii* G. Planch. (Fam. *Loganiaceæ*). Commercial curare is a brownish or black, shiny, resinoid mass. Soluble in cold water, very soluble in diluted alcohol.

Devarda's Alloy (*Devarda's Metal*)—A gray powder composed of 50 parts of copper, 45 parts of aluminum, and 5 parts of zinc.

Dextrose, $\text{C}_6\text{H}_{12}\text{O}_6 \cdot \text{H}_2\text{O}$ —Use *Dextrosum*, page 149.

Diiodofluorescein, $\text{C}_{20}\text{H}_{10}\text{O}_5\text{I}_2$ —Orange red, odorless powder. Slightly soluble in water, soluble in alcohol and in solutions of alkali hydroxides.

Residue on ignition—Ignite 0.2 Gm. with 5 drops of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.5 per cent).

Sensitiveness—Weigh accurately about 0.1 Gm. of potassium iodide, previously dried at 100°C . to constant weight, and dissolve it in 50 cc. of distilled water. Add 1 cc. of diiodofluorescein T.S. and 1 cc. of glacial acetic acid, and titrate with tenth-normal silver nitrate until the color of the precipitate changes from brownish red to a bluish red. The volume of tenth-normal silver nitrate consumed should not be in excess of 0.1 cc. over the calculated volume, based on the KI content of the dried potassium iodide as determined under *Potassii Iodidum*, page 377.

Dimethylglyoxime, $(\text{CH}_3)_2\text{C}_2(\text{NOH})_2$ —White, needle-shaped crystals, or a crystalline powder; almost insoluble in water, soluble in alcohol. It melts at about 240°C .

Insoluble in alcohol—Heat 2 Gm. under a reflux condenser with 100 cc. of alcohol until no more dissolves. Filter, wash with hot alcohol, dry at 105°C .: the weight of the insoluble residue does not exceed 1.0 mg. (0.05 per cent).

Residue on ignition—Ignite 2 Gm. of Dimethylglyoxime with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

p-Dimethylaminobenzaldehyde, $(\text{CH}_3)_2\text{N} \cdot \text{C}_6\text{H}_4\text{CHO}$ —White or pale yellow crystals or crystalline powder. Slightly soluble in water; soluble in alcohol, ether, and in dilute hydrochloric acid.

Melting point—From 73° to 75°C .

Residue on ignition—Not more than 0.1 per cent.

Solubility in alcohol—One Gm. dissolves completely in 25 cc. of alcohol.

Solubility in hydrochloric acid—A solution of 1 Gm. of 20 cc. of diluted hydrochloric acid is clear and colorless or only slightly yellow.

2,4-Dinitrochlorobenzene, $C_6H_3(NO_2)_2Cl$ —Yellow to brownish yellow crystals. Insoluble in water, soluble in hot alcohol, ether, or benzene. It melts between 51° and 53° C.

Residue on ignition—Ignite 0.5 Gm. with 5 drops of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.20 per cent).

Dinitrophenylhydrazine, $[2,4-C_6H_3(NO_2)_2NH.NH_2]$ —Orange red crystals, which, under the microscope, appear individually to be lemon yellow, lath-like needles; very slightly soluble in water, slightly soluble in alcohol, moderately soluble in dilute inorganic acids. When heated in a capillary tube the edges of the crystals soften at about 190° C., the mass sinters at about 194° C., and melts between 198° and 200° C.

Solubility in sulfuric acid—Dissolve 0.5 Gm. of dinitrophenylhydrazine in a mixture of 25 cc. of sulfuric acid and 25 cc. of distilled water: the solution is clear or not more than slightly turbid.

Ash—The ash from 0.5 Gm. is negligible.

Melting point of the hydrazone—When dinitrophenylhydrazene is used for the assay of *Spiritus Camphoræ* which has been prepared from natural camphor, as directed on page 427, the hydrazone, after drying to constant weight at 80° C., melts between 166° and 168° C.

Dioxane (Diethylene Dioxide), $C_4H_8O_2$ —Clear, colorless liquid having an ethereal odor. Sp. gr. about 1.031 at 25° C. Miscible with water and the usual organic solvents.

Boiling range—Dioxane distils between 101° and 103° C.

Congealing point—It congeals between 9° and 11° C.

Non-volatile—Evaporate 10 cc. on a steam bath and dry the residue for 1 hour at 110° C. The weight of the residue does not exceed 1 mg.

Diphenylamine, $(C_6H_5)_2NH$ —White crystals, possessing a slight, aromatic odor. Melting point: 52.5° to 53.5° C. Slightly soluble in water; soluble in alcohol.

Nitrate—Dissolve 0.20 Gm. of diphenylamine in 20 cc. of reagent sulfuric acid and 2 cc. of distilled water: the solution remains colorless.

Residue on ignition—Ignite 2 Gm. with 1 cc. of sulfuric acid. The weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Dithizone (Diphenyl-thiocarbazono), $C_6H_5.NH.NH.CS.N:N.C_6H_5$ —A bluish black or nearly black powder; insoluble in water; soluble in alcohol, chloroform, or carbon tetrachloride, yielding intensely green solutions even in high dilutions.

Residue on ignition—Ignite 1 Gm., cool, add 1 cc. of nitric acid and 1 cc. of sulfuric acid, and ignite gently to constant weight. The residue weighs not more than 3 mg.

Heavy metals—Digest the residue obtained in the test for *residue on ignition* with 10 cc. of ammonium acetate T.S. in a covered crucible on a steam bath for 30 minutes. Filter, and wash with 10 cc. of distilled water. To the combined filtrate and washings add 2 cc. of normal hydrochloric acid, dilute with distilled water to make 25 cc., and

add 10 cc. of hydrogen sulfide T.S. If a darkening is produced, it is not greater than that of a control made with 0.02 mg. of Pb (20 parts per million).

Sensitiveness—Prepare a chloroform solution of dithizone in the proportion of 10 mg. of the dithizone in 1000 cc. of chloroform. To 5 cc. of this solution add 0.10 cc. of *standard lead solution*, page 586, follow with 5 cc. of ammonia-cyanide solution, page 594, and shake well. The color of the chloroform layer is distinctly pink by comparison with a blank made with 5 cc. of the same dithizone solution treated in the same manner, but omitting the addition of the lead solution.

Eosin Y, Certified Biological (Yellowish Eosin Y)—*Sodium tetrabromofluorescein*, $C_{20}H_6Br_4O_5Na_2$. Red to brownish red pieces or powder. One Gm. dissolves in about 2 cc. of water or in 50 cc. of alcohol.

Color characteristics—A 1:500 aqueous solution is yellowish to purplish red with a greenish fluorescence. A 1:12,000 alcoholic solution is pink to purplish red with a greenish yellow fluorescence. The addition of mineral acids to its aqueous solution (1 in 100) produces an orange to reddish orange precipitate of tetrabromofluorescein. On adding 2 cc. of saturated aqueous sodium hydroxide to 10 cc. of an aqueous solution of the dye (1 in 100) a red precipitate is formed.

Assay—Weigh accurately about 0.5 Gm. and dissolve in 300 cc. of distilled water. Heat the solution to boiling, add 3 cc. of normal hydrochloric acid, and cool to about 25° C. Collect the precipitate on a tared Gooch crucible with asbestos pad, previously dried at 110° C. Wash the precipitate with small portions of cold water until the washings cease to react with silver nitrate T.S. Then dry at 110° C. to constant weight. The weight of the dried precipitate multiplied by 1.068 represents the quantity of the dye in the weight of the sample taken for the assay, and it corresponds to not less than 85 per cent.

Epinephrine, $C_6H_3(OH)_2CHOHCH_2NHCH_3$ —Use *Epinephrina*, page 164.

Ether—Use *Æther*, page 36, or *Æthylis Oxidum*, page 41.

Ether, Absolute, $C_2H_5OC_2H_5$ —It conforms to the description, test for non-volatile matter, acid, and for aldehyde under *Æther*, page 36, and in addition it must comply with the following tests:

Specific gravity—Not over 0.710, at 25°/25° C.

Non-volatile Matter—Allow 100 cc. to evaporate from a tared shallow dish and dry at 100° C. for 1 hour. The weight of the residue does not exceed 1.0 mg. (0.0015 per cent).

Peroxide—To 10 cc. of the ether, contained in a small, clean, glass-stoppered cylinder, previously rinsed with a portion of the ether under examination, add 1 cc. of a freshly prepared 10 per cent solution of potassium iodide. Shake the mixture and allow it to stand for 1 minute: no yellow color should be observable in either layer (limit of peroxide as H_2O_2 , about 0.001 per cent). **NOTE**—Fresh ether should meet this test, but after storage for several months peroxide may be formed.

Substances darkened by sulfuric acid—Cool 10 cc. of reagent sulfuric acid to about 10° C., and add, drop by drop, with gentle stirring, 10 cc. of the ether. The resulting mixture should not have more than a faint color.

Ethyl Acetate, $CH_3COOC_2H_5$ —A transparent, colorless, inflammable liquid.

Soluble in water, miscible with alcohol, ether, and with fixed and volatile oils. Specific gravity: 0.893 to 0.898 at 25° C.

Boiling range—Distil 100 cc. by method II, page 559: not less than 95 per cent distils between 76° and 77.5° C.

Non-volatile matter—Allow 20 cc. to evaporate in a dish and dry for 1 hour at from 105° to 110° C.: the weight of the residue should not exceed 1.0 mg. (0.005 per cent).

Acid—Ethyl acetate does not redden moistened blue litmus paper.

Foreign esters—Evaporate 5 cc. from clean, odorless, unsized paper: the final odor is not different in character from that observed at the beginning of the test.

Readily carbonizable substances—Superimpose 5 cc. of ethyl acetate upon 5 cc. of reagent sulfuric acid: no dark coloration is produced at the zone of contact.

Ethyl Cyanoacetate, $\text{CN} \cdot \text{CH}_2 \cdot \text{COOC}_2\text{H}_5$ —Colorless to pale yellow liquid, slightly pleasant odor. Slightly soluble in water; miscible with alcohol and with ether. At atmospheric pressure it boils between 205° and 209° C. with decomposition. At 10 mm. pressure it distils at about 90° C.

Specific gravity—1.057 to 1.062 at 25° C.

Free acid—Dissolve 2 cc. in 25 cc. of neutralized alcohol, add 2 drops of phenolphthalein T.S. and titrate with tenth-normal sodium hydroxide to the production of a pink color. Not more than 1.5 cc. of the sodium hydroxide solution is required.

Extract of Beef—Use extract of beef conforming to the requirements under Extractum Carnis, N. F. VII.

Ferric Ammonium Sulfate, $\text{FeNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ —Pale violet crystals, efflorescent on exposure to air. Very soluble in water; insoluble in alcohol.

Insoluble—Use 10 Gm. and dissolve in 100 cc. of distilled water containing 1 cc. of hydrochloric acid: the weight of the insoluble residue does not exceed 1.0 mg. (0.01 per cent), page 645.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.01 mg. of Cl (0.001 per cent), page 645.

Substances not precipitated by ammonia—Dissolve 5 Gm. in 70 cc. of distilled water, heat to boiling and pour into a mixture of 40 cc. of distilled water and 10 cc. of stronger ammonia T.S. Filter through a folded filter while hot and wash with hot distilled water until the filtrate measures 150 cc. Evaporate 60 cc. of the filtrate to dryness and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Ferrous iron—Dissolve 1 Gm. in a mixture of 20 cc. of distilled water and 1 cc. of reagent hydrochloric acid and add 1 drop of freshly prepared potassium ferri-cyanide T.S. No blue or green color should be produced in 1 minute (about 0.001 per cent ferrous Fe).

Zinc and copper—Neutralize with glacial acetic acid the remaining 90 cc. of the filtrate obtained in the test for *substances not precipitated by ammonia*, add an excess of 1 cc. of glacial acetic acid and 2 cc. of freshly prepared potassium ferrocyanide T.S. No turbidity or pink color appears in 30 minutes (about 0.005 per cent Cu, or Zn).

Ferric Chloride, $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ —Orange yellow or brown yellow, crystalline pieces. It is very deliquescent. Very soluble in water, freely soluble in alcohol, and soluble

in glycerin and in ether. Ferric chloride and its solutions are partly reduced to ferrous chloride by exposure to light.

Insoluble—The insoluble matter from 10 Gm., dissolved in 100 cc. of distilled water containing 1 cc. of hydrochloric acid, and washed with distilled water containing 0.5 cc. of hydrochloric acid in each 100 cc., weighs not more than 0.001 Gm. (0.01 per cent), page 645.

Nitrate, sulfate, alkali, and earths—Solution A—Dissolve 10 Gm. in 100 cc. of distilled water, heat the solution to boiling, and pour it into a mixture of 140 cc. of distilled water and 50 cc. of stronger ammonia T.S. Filter while still hot and wash with hot distilled water until the filtrate measures 300 cc.

Nitrate—To 15 cc. of Solution A add 0.1 cc. of indigo carmine T.S. and 15 cc. of sulfuric acid: the blue color does not disappear in 5 minutes (about 0.01 per cent of NO_3).

Sulfate—Evaporate 60 cc. of Solution A to 20 cc., add 3 cc. of normal hydrochloric acid, dilute with distilled water to 25 cc. and filter: the filtrate shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent). In making the blank, evaporate a volume of the stronger ammonia T.S., corresponding to the volume in the test, until free of ammonia.

Alkali and earths—To 30 cc. of Solution A, add 10 drops of sulfuric acid, evaporate, and ignite cautiously: the weight of the residue does not exceed 1.0 mg. (0.1 per cent).

Copper and zinc—Neutralize 60 cc. of Solution A with glacial acetic acid, add an excess of 1 cc. of the acid, dilute to 100 cc., and add 2 cc. of freshly prepared 10 per cent potassium ferrocyanide solution. No turbidity or pink color appears in 15 minutes (about 0.005 per cent of Cu or Zn).

Phosphorous compounds—To 5 Gm. add 20 cc. of distilled water and 20 cc. of reagent nitric acid and evaporate on a steam bath to a syrup. Add 50 cc. of distilled water, 15 cc. of reagent nitric acid, and 13 cc. of stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake for 5 minutes at 40° to 50° C., and allow to stand for 1 hour. Any precipitate formed should not be greater than is formed under the same conditions by 1.5 mg. of PO_4 (0.03 per cent PO_4).

Ferrous iron—Dissolve 0.5 Gm. of ferric chloride in 20 cc. of distilled water and 1 cc. of hydrochloric acid and add 1 drop of a freshly prepared 5 per cent solution of potassium ferricyanide: no blue color is produced in 1 minute (about 0.002 per cent).

Keep protected from light.

Ferric Citrate, ($\text{FeC}_6\text{H}_5\text{O}_7 \cdot x\text{H}_2\text{O}$)—Thin, transparent, garnet red scales, or brown granules. Slowly soluble in water, more readily soluble in hot water, the solubility diminishing with age. It is insoluble in alcohol.

Assay—Weigh accurately about 1 Gm. of Ferric Citrate, dissolve it in a mixture of 5 cc. of reagent hydrochloric acid and 25 cc. of distilled water in a glass-stoppered flask, warming if necessary, to aid solution. Cool, add 4 Gm. of potassium iodide, stopper the flask and allow it to stand for 15 minutes. Dilute it with 100 cc. of distilled water and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.005585 Gm. of Fe. It shows not less than 16.5 per cent and not more than 18.5 per cent of Fe.

Chloride—Heat 1 Gm. with 25 cc. of distilled water and 2 cc. of nitric acid until

dissolved. Cool, dilute to 100 cc. with distilled water, and mix well. To 10 cc. of the solution add 1 cc. of silver nitrate T.S.: no turbidity is produced at once.

Sulfate—To 10 cc. of the solution obtained in the preceding test, add 1 cc. of barium nitrate T.S.: no turbidity is produced in 15 seconds.

Tartrate—Dissolve 0.5 Gm. by heating it with 15 cc. of distilled water on a water bath, then add to the solution 10 cc. of potassium hydroxide T.S., boil for a few minutes and filter. To half of the filtrate add 2 cc. of glacial acetic acid, cool, and allow to stand for 1 hour with frequent agitation: no white precipitate, soluble in ammonia T.S., is produced.

Alkali citrate—Ignite about 0.5 Gm. until it is thoroughly charred, cool, and add 2 cc. of hot distilled water. The water is neutral or shows only a slight alkaline reaction to litmus paper.

Ammonia—Heat 0.5 Gm. with 5 cc. of sodium hydroxide T.S.: the odor of ammonia is not perceptible.

Ferrous Sulfate, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ —Use *Ferri Sulfas*, page 185.

Ferrous Sulfide, FeS —Grayish black lumps, fragments, sticks, granules, or globules. Insoluble in water but dissolved by dilute sulfuric or dilute hydrochloric acid with copious evolution of hydrogen sulfide. Contains at least 70 per cent of ferrous sulfide.

Filter Paper, Quantitative—For the Mercuric Bromide Test Paper used in testing for arsenic, use Swedish O filter paper or other makes of like surface, quality, and ash.

Formic Acid, HCO_2H —Colorless liquid having a very pungent odor. It is *highly caustic*. Miscible with water and alcohol. Sp. gr. about 1.2 at 25° C.

Assay—Tare a flask containing about 10 cc. of distilled water, then quickly add about 1 cc. of the acid, and reweigh. Dilute with 50 cc. of distilled water and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 0.04603 Gm. of HCO_2H . Not less than 85 per cent of HCO_2H should be found.

Non-volatile matter—Evaporate 40 cc. to dryness on a steam bath and dry at 105° C. for 2 hours. The weight of the residue does not exceed 1.0 mg. (0.002 per cent).

Substances precipitated by water—Dilute 5 cc. of the acid with 15 cc. of distilled water; no turbidity is observed within 1 hour.

Acetic acid—Dilute 1 cc. with distilled water to 100 cc. To 10 cc. of the dilution add 1.5 Gm. of yellow mercuric oxide, heat on a steam bath for 20 minutes and filter. The filtrate does not redden blue litmus paper in 30 seconds (about 0.4 per cent $\text{CH}_3\text{CO}_2\text{H}$).

Chloride—Dilute 4 cc. of the acid with 5 cc. of distilled water, then add 3 cc. of nitric acid and 1 cc. silver nitrate T.S. Any turbidity produced corresponds to not more than 0.05 mg. of Cl (0.001 per cent Cl).

Sulfate—To 4 cc. of the acid add 20 mg. of sodium carbonate and evaporate to dryness on a steam bath. Dissolve the residue in 5 cc. of distilled water and 1 cc. of normal hydrochloric acid, filter if necessary, dilute with distilled water to 10 cc. and add 1 cc. of barium chloride T.S. Any turbidity produced in 10 minutes is not greater than in a blank test to which 0.10 mg. of SO_4 has been added (0.002 per cent SO_4).

Sulfite—Mix 25 cc. of the acid with 25 cc. of distilled water and add 0.1 cc. of tenth-normal iodine. The mixture retains a distinct yellow color (0.001 per cent SO_2).

Heavy metals—Evaporate 4 cc. of the acid in a porcelain dish to about 1 cc. Add 10 cc. of distilled water and 1 drop of phenolphthalein T.S. and follow with ammonia T.S. until a slight pink color is produced. Add 2 cc. of normal hydrochloric acid, dilute with distilled water to 30 cc., and add 10 cc. of hydrogen sulfide T.S. Any darkening produced is not greater than in a control made with 0.025 mg. of Pb and 0.5 cc. of tenth-normal hydrochloric acid (5 parts per million).

Iron—Make the solution resulting from the test for heavy metals alkaline with ammonia T.S. Any resulting green color is not darker than that produced by adding 0.03 mg. of iron to the control and making it alkaline with ammonia T.S.

Fuchsin, Basic—A mixture of rosaniline and pararosaniline hydrochlorides. Crystals or crystalline fragments with a glossy, greenish bronze luster. Soluble in water, in alcohol, and in amyl alcohol.

An aqueous solution (1 in 500) yields a red precipitate upon the addition of tannic acid T.S.

To 10 cc. of an aqueous solution (1 in 500) add 10 cc. of ammonia T.S. and 0.50 Gm. of zinc dust and agitate the mixture; the solution becomes decolorized. Place a few drops of the decolorized solution upon filter paper and near by, on the same paper, place a few drops of dilute hydrochloric acid: a red color should develop at the zone of contact.

Loss on drying—When dried at 100°C . to constant weight, the loss does not exceed 5 per cent.

Residue on ignition—Ignite 1 Gm. to constant weight with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 3 mg. (0.3 per cent).

Furfural, $\text{C}_4\text{H}_3\text{O} \cdot \text{CHO}$ —Furfural is a clear, colorless liquid when freshly distilled, but soon turns yellowish brown to reddish brown. Specific gravity: about 1.16 at 25°C . Ninety-five per cent distills between 150° and 152°C .

Keep in well-closed containers, protected from light.

Before use it should be freshly distilled.

Gallic Acid, $\text{C}_6\text{H}_2(\text{OH})_3\text{COOH} \cdot \text{H}_2\text{O}$ —White, or nearly white crystals or powder. Sparingly soluble in cold water, very soluble in boiling water and in alcohol.

Distinction from tannic acid—A cold, saturated, aqueous solution of gallic acid neither colors nor precipitates solutions of pure ferrous salts and yields no precipitate with gelatin T.S.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid to constant weight: not more than 1.0 mg. of residue remains (0.1 per cent).

Sulfate—Dissolve 1 Gm. in 50 cc. of hot distilled water, cool in ice water, and filter. Add to the filtrate 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S.: no turbidity is produced in 5 minutes (about 0.02 per cent SO_4).

Gelatin—Use *Gelatinum*, page 197.

Glass Wool—Fine threads of glass.

Soluble substances—Boil 1 Gm. of glass wool for 30 minutes with diluted hydrochloric acid and filter. Evaporate the filtrate to constant weight at from 105° to 110°C .: the residue weighs not more than 5.0 mg. (0.5 per cent).

Heavy metals—Boil 1 Gm. of glass wool for 5 minutes with a mixture of 25 cc. each of diluted nitric acid and distilled water, filter, and evaporate the filtrate to dryness. Dissolve the residue in 10 cc. of distilled water to which 3 drops of hydrochloric acid are added, again filter, and add an equal volume of hydrogen sulfide T.S. to the filtrate: no darkening is produced.

Glycerin (Glycerol)—Use *Glycerinum*, page 202.

Gold Chloride (Chlorauric Acid), $\text{HAuCl}_4 \cdot 4\text{H}_2\text{O}$ —Yellow, hygroscopic crystals. Very soluble in water, soluble in alcohol and in ether.

Assay—Weigh accurately about 0.2 Gm., add 2 cc. of ammonium oxalate T.S., evaporate to dryness, and ignite to constant weight. The weight of the resulting metallic gold corresponds to not less than 47 per cent.

Other metals—Heat the metallic gold obtained in the assay with 5 cc. of dilute reagent nitric acid (1 in 3) for 15 minutes on a water bath, add 15 cc. of distilled water, and filter. Evaporate the filtrate to dryness on a water bath, add 1 cc. of glacial acetic acid and 40 cc. of distilled water, and filter. To 20 cc. of the filtrate add 10 cc. of hydrogen sulfide T.S.: no appreciable coloration is produced. Now render the solution slightly alkaline with ammonia T.S.: not more than a slight greenish color develops.

Hematoxylin (Hydroxybrasilin), $\text{C}_{16}\text{H}_{14}\text{O}_6 \cdot 3\text{H}_2\text{O}$ —A crystalline substance derived from the heart-wood of *Hæmatoxylon campechianum* Linné (Fam. *Leguminosæ*). Colorless to yellow prisms; very slightly soluble in cold water or in ether, readily soluble in hot water or in hot alcohol. When exposed to light, hematoxylin acquires a red color and yields a yellow solution. It dissolves in ammonia T.S. or in solutions of alkali hydroxides or carbonates. When dissolved in aqueous solutions of the following salts, hematoxylin develops the colors indicated: in alum solution a red color; in stannous chloride solution a rose color; in solutions of cupric salts a greenish gray color; and it gradually turns black in potassium dichromate solution.

Preserve hematoxylin and its solution protected from light and air.

Hydriodic Acid, (HI + Water)—Nearly colorless, when freshly made, but rapidly becomes yellow to brown due to the liberation of iodine. Sp. gr. about 1.7 at 25° C. Boils at about 127° C. Miscible with water or alcohol. Keep in tight, light-resistant containers.

Assay and free iodine—Tare a stoppered flask containing about 10 cc. of distilled water, then add about 0.5 cc. of the acid, and reweigh. Dilute with 25 cc. of distilled water and titrate the free iodine with tenth-normal sodium thiosulfate, using starch T.S. toward the end. Not more than 1.0 per cent of free iodine is found. Now titrate the solution with tenth-normal sodium hydroxide using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide corresponds to 0.01279 Gm. of HI. Not less than 52 per cent of HI is present.

Non-volatile matter—To 6 cc. of the acid add 2 drops of sulfuric acid, evaporate in a porcelain crucible, and ignite to constant weight. The weight of the residue does not exceed 1.0 mg. (0.01 per cent).

Chloride or bromide—Dilute 1.2 cc. of the acid with distilled water to 100 cc. and mix well. To 1.0 cc. of the dilution add a volume of standard sodium chloride solution

equivalent to 0.04 mg. of chloride ion and dilute with distilled water to 20 cc. Dilute 5 cc. of the dilution of the acid with distilled water to 20 cc. Add to each aliquot 1 cc. of stronger ammonia T.S. and then add to each slowly, and with vigorous stirring, 2 cc. of 5 per cent silver nitrate solution. Heat to boiling for 5 minutes while stirring thoroughly, cool, shake well and filter. To the filtrates add nitric acid until neutral and then 1 cc. more of the acid. The turbidity in the 5-cc. aliquot is not greater than the turbidity in the 1 cc. aliquot (0.05 per cent as Cl).

Phosphorus—To 6 cc. of the acid add 5 cc. of nitric acid and evaporate on a steam bath until the iodine is volatilized, re-evaporating the residue, if necessary, with several portions of distilled water. Add to the residue 10 cc. of nitric acid. Dilute with 50 cc. of distilled water and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the solution at about 40° C. for 5 minutes and allow to stand for 30 minutes. Any precipitate formed is not greater than is produced when a quantity of potassium biphosphate, page 698, corresponding to 0.03 mg. of phosphorus, is treated in the same manner as the acid (0.0003 per cent P).

Sulfate—Dilute 3 cc. of the acid with 45 cc. of distilled water and neutralize with ammonia water T.S., then add 1 cc. hydrochloric acid. Heat to boiling, add 3 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, filter, wash thoroughly with hot distilled water, ignite, and weigh. The weight of the ignited precipitate is not more than 1.3 mg. greater than the weight obtained from a blank test made with the same quantities of the reagent and in the same manner as with the acid, including filtration and ignition even if no precipitate is visible in the blank (0.01 per cent SO₄).

Heavy metals—To 1.2 cc. of the acid add 3 cc. of sulfuric acid and heat gently until the iodine is volatilized. Cool, cautiously add 20 cc. of distilled water, neutralize to litmus paper with ammonia T.S., then add 1 cc. of tenth-normal hydrochloric acid and dilute with distilled water to 30 cc. and add 10 cc. of hydrogen sulfide T.S. Any color produced is not darker than a control made with the same quantities of reagents and to which has been added 0.06 mg. of Pb (30 parts per million).

Iron—To the residue obtained in the test for non-volatile matter, add 2 cc. of hydrochloric acid and 5 drops of nitric acid and warm until no more dissolves. Then dilute with distilled water to 100 cc. To 20 cc. of the dilution, filtered if necessary, add 1 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S. Any red color produced is not greater than that of a control made with 0.04 mg. of Fe (20 parts per million).

Hydrochloric Acid, Reagent, HCl—A colorless, fuming liquid, having a pungent odor.

Specific gravity—About 1.18, at 25° C.

Assay—When assayed by the method outlined under *Acidum Hydrochloricum*, page 20, it contains not less than 35 per cent by weight of HCl.

Non-volatile matter—Evaporate 85 cc. of the acid to dryness in a platinum dish. Add a drop of reagent sulfuric acid, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 0.5 mg. (0.0005 per cent).

Free chlorine—To 25 cc. of the acid add 25 cc. of freshly boiled distilled water and cool: add 2 drops of 2 per cent potassium iodide solution and 1 cc. of carbon disulfide, and mix. The carbon disulfide should not acquire a pink color in 30 seconds (about 0.0002 per cent). **NOTE**—The potassium iodide used must be free from iodate.

Sulfite—Add 0.05 cc. of tenth-normal iodine and a few drops of starch T.S. to 50 cc. of distilled water, and then add 5 cc. of the acid, previously diluted with 50 cc. of distilled water. The mixture should retain a blue color after mixing (about 0.003 per cent of SO_2).

Sulfate—Add about 0.1 Gm. of sodium carbonate to 20 cc. of the acid and evaporate to dryness. The residue, dissolved in 25 cc. of distilled water, shows no more sulfate than corresponds to 0.05 mg. of SO_4 (0.0002 per cent), page 645.

Arsenic—Determine by the method outlined on page 554, using 17 cc. of the acid for the generation of the hydrogen. The acid is to be diluted with 3 volumes of distilled water and a correspondingly larger generator flask is used. The stain produced corresponds to not more than 0.002 mg. of As (0.00001 per cent).

Heavy metals—Evaporate 10 cc. of the acid to dryness, moisten the residue with 5 drops of hydrochloric acid, dilute to 35 cc. with distilled water, and add 15 cc. of hydrogen sulfide T.S.: no darkening should be observed (about 3 parts per million).

Iron—To 40 cc. of the acid add about 0.05 Gm. of potassium nitrate and evaporate in glass or porcelain to about 2 cc. Dilute with 20 cc. of distilled water and add 2 cc. of ammonium thiocyanate T.S. Any reddish color produced is not greater than that produced by 0.05 mg. of Fe in an equal volume of solution containing the same quantities of the same reagents used in the test and 1 cc. of the acid (1 part per million).

Hydrochloric Acid, Diluted (10 per cent)—This acid is prepared by mixing 236 cc. of reagent hydrochloric acid with sufficient distilled water to make 1000 cc.

Hydrogen Peroxide, 30 Per Cent—Clear, colorless liquid. Miscible with water. Specific gravity about 1.1.

Do not mix with any organic substances as explosions are liable to occur. Store in partly-filled containers, preferably with a small vent in the closure, and in a cool place. Handle with caution as it attacks the skin.

Assay—Tare a weighing bottle containing about 5 cc. of distilled water, then add to it about 1 cc. of the hydrogen peroxide, and reweigh. Dilute with distilled water to exactly 100 cc. and mix well. To 20 cc. of the dilution add 20 cc. of diluted sulfuric acid and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.001701 Gm. of H_2O_2 . Not less than 28 per cent of H_2O_2 should be found.

Non-volatile matter—Evaporate 18 cc. to dryness on a steam bath and dry the residue at 105°C . for 2 hours. Not more than 1.0 mg. of residue remains (about 0.005 per cent).

Free acid—Dilute 9 cc. (10 Gm.) with 90 cc. of carbon dioxide-free water, add 3 drops of methyl red T.S., and titrate with fiftieth-normal sodium hydroxide. Not more than 0.3 cc. of the sodium hydroxide is required to produce a yellow color, correcting for any sodium hydroxide consumed by a blank.

Chloride—Dilute 2.7 cc. with 50 cc. of distilled water and add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that in a control made with 0.03 mg. of Cl (0.001 per cent).

Nitrogen—To 5 cc. of the hydrogen peroxide add 1 drop of sulfuric acid and evaporate on a steam bath to about 2 cc. Transfer the residue to a Kjeldahl flask with the aid of 10 cc. of sulfuric acid containing 0.1 Gm. of salicylic acid. Allow to

stand for 30 minutes, then add 0.2 Gm. of sodium thiosulfate and 5 Gm. of potassium sulfate, and digest in the usual manner of nitrogen determination by the Kjeldahl method, page 598. Cool, dilute with 100 cc. of distilled water, again cool, add 60 cc. of 30 per cent sodium hydroxide solution, and immediately connect the flask with a well-cooled condenser and a receiver containing 5 cc. of distilled water and 1 drop of diluted hydrochloric acid. Distil until about 50 cc. of distillate has been collected, then add to the distillate 2 cc. of 10 per cent sodium hydroxide and 2 cc. of Nessler's reagent. The color produced is not darker than is produced by treating a quantity of ammonium chloride equivalent to 0.05 mg. of nitrogen in the same manner as the hydrogen peroxide (0.001 per cent N).

Phosphate—Evaporate 9 cc. to dryness on a steam bath. Add to the residue 10 cc. of nitric acid and 50 cc. of distilled water and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° C. for 5 minutes, and allow to stand for 30 minutes. Any yellow precipitate formed is not more than is produced when a quantity of potassium biphosphate, equivalent to 0.05 mg. of PO_4 , is treated in the same manner (0.0005 per cent PO_4).

Sulfate—Dilute 2 cc. with 20 cc. of distilled water, add 2 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. Any turbidity produced is not greater than in a control made with 0.1 mg. of SO_4 (0.005 per cent).

Heavy metals—Evaporate 2 cc. to dryness on a steam bath, warm the residue with 1 cc. of normal hydrochloric acid and 20 cc. of distilled water, cool, and add 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Hydrogen Sulfide, H_2S —A colorless, poisonous gas; heavier than air. It is soluble in water. Generated by treating ferrous sulfide with diluted sulfuric or diluted hydrochloric acid. Other sulfides yielding hydrogen sulfide with diluted acids may be used.

Hydroxylamine Hydrochloride, $\text{NH}_2\text{OH}.\text{HCl}$ —Colorless crystals or a white crystalline powder; very soluble in water, soluble in alcohol.

Assay—Weigh accurately about 0.1 Gm. of Hydroxylamine Hydrochloride and dissolve it in 20 cc. of distilled water. Add a solution of 5 Gm. of ferric ammonium sulfate, dissolved in 20 cc. of distilled water, then add 15 cc. of diluted sulfuric acid, boil for 5 minutes, dilute with 200 cc. of distilled water, and titrate the solution with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.003475 Gm. of $\text{NH}_2\text{OH}.\text{HCl}$. It shows not less than 95 per cent of $\text{NH}_2\text{OH}.\text{HCl}$.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: not more than 1.0 mg. of residue remains.

Insoluble in alcohol—A solution of 1 Gm. in 25 cc. of alcohol is clear and colorless.

Sulfate—Dissolve 1 Gm. in 20 cc. of distilled water, add 5 drops of diluted hydrochloric acid, heat to boiling, and add 1 cc. of barium chloride T.S.: no precipitate or turbidity is produced within one hour (about 0.01 per cent SO_4).

Ammonium salts—To the solution obtained in the test for *insoluble in alcohol* add 1 cc. of platinum chloride T.S. The solution remains clear for 10 minutes (about 0.1 per cent NH_3).

Heavy metals—The heavy metals limit for hydroxylamine hydrochloride is 20 parts per million, using 1.0 Gm. for the test, page 646.

Indicators—See pages 746 and 769.

Indigo Carmine (*Sodium Indigotindisulfonate*), $C_{16}H_8O_2N_2(SO_3Na)_2$ —A blue powder acquiring, when compressed, a coppery luster. It is sparingly soluble in water, yielding a dark blue solution. It is almost insoluble in alcohol.

Assay—Dry about 0.3 Gm. of indigo carmine to constant weight at $100^\circ C.$; weigh accurately about 0.2 Gm. of the dried salt, dissolve it in 10 cc. of distilled water, add 1 cc. of sulfuric acid, and dilute in a porcelain dish with 600 cc. of distilled water. Then titrate the solution with tenth-normal potassium permanganate. The end-point of the titration is the change in color from green to light yellow. Each cc. of tenth-normal potassium permanganate is equivalent to 0.01165 Gm. of $C_{16}H_8O_2N_2(SO_3Na)_2$. It shows not less than 60 per cent of $C_{16}H_8O_2N_2(SO_3Na)_2$.

Insoluble in water—Dissolve 1 Gm. of indigo carmine in 200 cc. of distilled water, filter the solution through counterbalanced filters or a Gooch crucible, wash the residue and the filters with distilled water until the washings cease to be colored blue, and dry at $100^\circ C.$: the insoluble residue does not exceed 20.0 mg. (2 per cent).

Starch or starch iodide—Boil 0.2 Gm. of indigo carmine for 2 minutes with 10 cc. of distilled water, cool, and then agitate the solution with small portions of bromine T.S. until the blue color disappears: no blue color is produced in this liquid by the addition of a few drops of potassium iodide T.S.

Iron ferri- or ferro-cyanide—Add 15 cc. of hydrogen peroxide T.S. and 10 cc. of sodium hydroxide T.S. to 0.2 Gm. of the salt, shake the mixture until the blue color disappears, evaporate the liquid to about 10 cc., cool, acidulate with hydrochloric acid, and add a few drops of ferrous sulfate T.S.: the liquid does not become blue.

Iodine, I—Sublimed iodine in the form of bluish black plates.

Non-volatile matter—Vaporize 5 Gm. on a water bath to constant weight: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Chlorine and bromine—Triturate 5 Gm. of the powdered iodine with 25 cc. of distilled water and allow to stand for 30 minutes with frequent stirring. Filter, and to 20 cc. of the filtrate add dilute sulfurous acid (1 in 10) drop by drop, until the color of iodine is just discharged. Add 1 cc. of ammonia T.S. and 1 cc. of tenth-normal silver nitrate. Filter and to the clear filtrate add 2 cc. of nitric acid. The turbidity is not greater than is produced by 0.2 mg. of chloride ion in 20 cc. of distilled water to which are added the same quantities of ammonia T.S., silver nitrate, and nitric acid used in the original test (0.005 per cent as Cl).

Iodine Pentoxide (*Iodic Anhydride*), I_2O_5 —White, crystalline powder, soluble in water, insoluble in alcohol or in ether. When heated to about $300^\circ C.$, it decomposes into iodine and oxygen. When heated in the presence of sulfur or organic matter, deflagration takes place.

Assay—Dry about 0.5 Gm. to constant weight over sulfuric acid, weigh accurately, and dissolve it in sufficient distilled water to measure exactly 100 cc. Dilute 20 cc. of this solution with 30 cc. of distilled water, add 2 Gm. of potassium iodide and 5 cc. of diluted sulfuric acid, allow to stand for 10 minutes in the dark, then titrate the liberated iodine with tenth-normal sodium thiosulfate. Correct for any iodine liberated in a blank made with the same quantity of the reagents. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.002782 Gm. of I_2O_5 . It shows not less than 98 per cent of I_2O_5 .

Residue on ignition—Ignite 2 Gm. in a crucible to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Heavy metals—Add to the residue obtained in the test for *residue on ignition* 1 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 646; the heavy metals limit for iodine pentoxide is 10 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.04 mg. of Fe (20 parts per million), page 646.

Iron Wire, Fe—Bright, fine wire. Keep in well-closed containers.

Assay—Weigh accurately from 0.17 to 0.20 Gm. of the clean, dry wire and transfer it to a 250-cc. or a 300-cc. flask. Add 50 cc. of diluted sulfuric acid and close the flask with a valve-stopper prepared as described in the assay under *Potassium Chlorate*, page 702. Heat until the wire is dissolved, then cool, dilute with 25 cc. of freshly boiled and cooled distilled water, then titrate with tenth-normal potassium permanganate to the production of a slight pink color. Each cc. of tenth-normal potassium permanganate is equivalent to 0.005585 Gm. of Fe. It contains not less than 99.8 per cent of Fe.

Insoluble in sulfuric acid—To 2 Gm. of the iron wire add, in portions, a mixture of 4 cc. of sulfuric acid and 50 cc. of distilled water and heat gently on a steam bath if necessary, until hydrogen is no longer evolved. Filter the undissolved residue, wash it well, first with approximately 2 per cent sulfuric acid, then with distilled water and dry at 105° to 110° C. The weight of the residue does not exceed 2.4 mg. (0.12 per cent).

Isatin, C₆H₄CONCOH—Small, yellowish red crystals, slightly soluble in water, soluble in alcohol and in ether. Aqueous, alcoholic, or ethereal solutions of isatin are reddish brown in color. When isatin is dissolved in a solution of an alkali hydroxide, it yields a violet-colored solution which upon heating or long standing becomes yellow.

Melting point—From 198° to 201° C.

Residue on ignition—Ignite 0.5 Gm. to constant weight: the weight of the residue does not exceed 2.0 mg. (0.40 per cent).

Isobutyl Alcohol (Isopropylcarbinol), (CH₃)₂CHCH₂OH—A clear, colorless liquid having a characteristic odor. Specific gravity about 0.80 at 25° C. Soluble in about 10 volumes of water; miscible with alcohol or ether.

Boiling range—Determine by method II, page 559, using 50 cc. All of it should distil between 106° and 109° C.

Non-volatile residue—Evaporate 25 cc. to dryness on a steam bath and dry for 1 hour at 110° C.: not more than 1.0 mg. of residue remains (0.005 per cent).

Water—A mixture of 5 cc. of the alcohol with 50 cc. of benzene is clear.

Acidity—To 50 cc. of distilled water add 2 drops of phenolphthalein T.S. and then fiftieth-normal sodium hydroxide until a pink color is produced. Disregard this quantity of the sodium hydroxide consumed. Then add 5 cc. of the Isobutyl Alcohol, mix and titrate with fiftieth-normal sodium hydroxide until the pink color is reproduced. The latter titration requires not more than 0.5 cc. of the sodium hydroxide solution.

Alkalinity—A solution of 1 cc. of the alcohol in 15 cc. of distilled water does not affect moistened red litmus paper.

Kerosene—A mixture of hydrocarbons, chiefly of the methane series. It is a clear, colorless liquid, possessing a characteristic, but not disagreeable odor. Specific gravity: about 0.80, at 25° C. It distils between 180° and 300° C.

Purified kerosene can be prepared by shaking a convenient volume with about one-tenth of its volume of 15 per cent sodium hydroxide solution: repeat this treatment and then wash with distilled water until free from alkali.

Lead Acetate, $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$ —Use *Plumbi Acetas*, page 368.

Lead Carbonate (*Basic Lead Carbonate*), $(\text{PbCO}_3)_2 \cdot \text{Pb}(\text{OH})_2$ —A white, heavy powder, insoluble in water and in alcohol. It is dissolved by acetic acid or diluted nitric acid with effervescence.

Insoluble in acetic acid—Dissolve 5 Gm. by heating with a mixture of 50 cc. of distilled water and 7 cc. of glacial acetic acid. If an insoluble residue remains, filter, wash with a mixture of 100 volumes of distilled water and 2 cc. of glacial acetic acid, and dry to constant weight at from 105° to 110° C.: the weight of the residue does not exceed 2.5 mg. (0.05 per cent).

Chloride—The chloride in 1 Gm., dissolved in a mixture of 2 cc. of nitric acid and 30 cc. of distilled water, corresponds to not more than 0.05 mg. of Cl (0.005 per cent Cl).

Nitrate—Dissolve 2 Gm. in a mixture of 10 cc. of distilled water and 4 cc. of glacial acetic acid. Heat, if necessary, on a water bath to effect solution. Add about 10 mg. of sodium chloride and dilute to 20 cc. with distilled water. To 10 cc. of the solution add 0.2 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid and stir thoroughly. The blue color should not entirely disappear in 10 minutes (about 0.005 per cent NO_3).

Alkalies and alkaline earths—Dissolve 2 Gm. by heating with a mixture of 20 cc. of distilled water and 3 cc. of nitric acid. Nearly neutralize with ammonia T.S., dilute to 100 cc. with distilled water, and completely precipitate the lead with hydrogen sulfide. Filter, to 50 cc. of the filtrate add a few drops of reagent sulfuric acid, evaporate to dryness, and ignite: the weight of the residue does not exceed 2.0 mg. (0.20 per cent).

Iron—Warm the residue obtained in the test for *alkalies and alkaline earths* with 1 cc. of hydrochloric acid and 2 drops of nitric acid. Dilute to 20 cc. with distilled water; add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color produced should correspond to not more than that produced by 0.05 mg. of Fe under the same conditions (50 parts per million).

Zinc—Dissolve 3 Gm. in a mixture of 25 cc. of distilled water and 5 cc. of glacial acetic acid, dilute with distilled water to 42 cc., add with stirring 3 cc. of sulfuric acid, and filter. To 30 cc. of the filtrate add 5 drops of nitric acid, heat to boiling, and pour into a mixture of 10 cc. of stronger ammonia T.S. and 20 cc. of distilled water. Filter while hot and wash with 2 cc. of hot distilled water. Neutralize with glacial acetic acid and add 1 cc. of the acid in excess, cool, and add 2 cc. of freshly prepared potassium ferrocyanide T.S.: no turbidity should appear in 10 minutes.

Lead Dioxide (*Lead Peroxide*), PbO_2 —A dark brown powder. Insoluble in water and in alcohol. Insoluble in nitric acid: decomposed by hydrochloric acid with the evolution of chlorine. It is dissolved by concentrated solutions of alkali hydroxides.

Assay—Treat 0.5 Gm., accurately weighed, with 15 cc. of diluted nitric acid (1 in 2), add from a pipette 20 cc. of hydrogen peroxide solution (1 volume of hydrogen peroxide T.S. and 3 volumes of distilled water) and stir until solution is complete. Solution can be hastened, if necessary, by the addition of 100 cc. of warm distilled water. Titrate the excess of hydrogen peroxide with tenth-normal potassium permanganate. Titrate also 20 cc. of the diluted hydrogen peroxide, treated with 15 cc. of the nitric acid (1 in 2). Each cc. of tenth-normal potassium permanganate is equivalent to 0.01196 Gm. of PbO_2 . The difference between the 2 titrations corresponds to not less than 90 per cent of PbO_2 .

Acid-insoluble matter—To 1 Gm. of the lead dioxide add 25 cc. of distilled water and 3 cc. of nitric acid; add with stirring 5 cc. of hydrogen peroxide T.S. or more, if needed, to dissolve all of the lead dioxide. Filter through asbestos in a Gooch crucible, wash, and dry to constant weight at from 105° to 110° C. The weight of the residue should not exceed 3.0 mg. (0.30 per cent). (Reserve the filtrate from this test to test for substances not precipitated by hydrogen sulfide.)

Carbonate—Mix 1 Gm. in a test tube with 1 cc. of distilled water, then gradually add 1 cc. of nitric acid; no evolution of gas is noticeable (about 0.10 per cent CO_2).

Chloride—Dissolve 1 Gm. in a mixture of 15 cc. of diluted acetic acid and 10 cc. of hydrogen peroxide T.S. Filter, and dilute to 50 cc. with distilled water. To 10 cc. of this solution add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that produced by 0.01 mg. of chloride ion in an equal volume of solution containing the same quantities of the same reagents used in the test (about 0.005 per cent Cl).

Nitrate—Boil 2 Gm. with a mixture of 5 cc. of glacial acetic acid and 15 cc. of distilled water for 5 minutes. Cool, dilute to the original volume, and filter. Superimpose 10 cc. of the clear filtrate upon 10 cc. of diphenylamine T.S.: no blue ring should develop at the zone of contact within 20 minutes (about 0.005 per cent NO_3).

Sulfate—To 4 Gm. add 10 cc. of hydrochloric acid and 3 cc. of nitric acid and evaporate to dryness on a water bath. Add 25 cc. of distilled water and 4 Gm. of sodium carbonate and digest on a water bath for 3 hours with occasional stirring. Dilute to 100 cc. with distilled water, mix well, and filter. Neutralize 50 cc. of the filtrate with reagent hydrochloric acid, then add 5 drops more of the acid, heating the solution to boiling. Add 5 cc. of barium chloride T.S. and allow to stand over night. If a precipitate is present, proceed as directed for the determination of sulfur compounds under dibasic ammonium phosphate, page 654. The weight of the barium sulfate is not greater than 5.0 mg. (0.10 per cent SO_4).

Manganese—Decompose 5 Gm. with 15 cc. of hydrochloric acid. Add 10 cc. of sulfuric acid and evaporate until it fumes. Cool and cautiously add 20 cc. of distilled water. Add 0.5 Gm. of the lead peroxide, heat on a water bath for 5 minutes, dilute to 50 cc., and filter through asbestos. The color is not greater than that produced by 0.015 mg. of Mn treated with the same quantities of the same acids and reagent used in the original test (3 parts per million).

Other metals precipitated by hydrogen sulfide—Dissolve 0.5 Gm. in 5 cc. of nitric acid and 10 cc. of hydrogen peroxide T.S. Add 5 cc. of sulfuric acid and evaporate until it fumes. Cautiously dilute to 50 cc. with distilled water and allow to stand until the solution is cool and the precipitate has settled. Filter but do not wash, and pass hydrogen sulfide gas through the filtrate: no red color should be produced,

and any darkening is not greater than that caused by 0.1 mg. of lead in the same volume of solution when hydrogen sulfide is added.

Substances not precipitated by hydrogen sulfide—Evaporate to dryness the filtrate obtained in the test for *acid-insoluble matter*, moisten the residue with 5 drops of hydrochloric acid, and dissolve in 100 cc. of hot distilled water. Pass in hydrogen sulfide gas until all of the lead is precipitated and filter without washing. Evaporate 50 cc. of the filtrate to dryness and ignite gently. The weight of the residue, after correcting for the non-volatile matter in the hydrogen peroxide, does not exceed 2.5 mg. (0.50 per cent).

Lead Monoxide (*Litharge*), PbO —A heavy, yellowish, or reddish yellow powder. It is insoluble in water or alcohol; soluble in acetic acid or diluted nitric acid; also soluble in warm solutions of the fixed alkali hydroxides.

Assay—Weigh accurately about 0.3 mg. of the freshly ignited lead monoxide and dissolve it by warming with 10 cc. of distilled water and 1 cc. of glacial acetic acid in a 200-cc. volumetric flask. Dilute with 75 cc. of distilled water, heat to boiling, add 50 cc. of tenth-normal potassium dichromate and boil for 2 to 3 minutes. Cool, dilute with distilled water to the 200 cc. mark, mix well and allow to subside. Withdraw exactly 100 cc. of the clear liquid and transfer it to a glass-stoppered flask. Add 10 cc. of diluted sulfuric acid and 1 Gm. of potassium iodide, stopper, mix gently and allow to stand for 10 minutes. Then titrate the liberated iodine, representing the excess of the dichromate, adding starch T.S. near the end. Each cc. of tenth-normal potassium dichromate is equivalent to 0.007440 Gm. of PbO .

Insoluble in acetic acid—To 2 Gm. of the Oxide add a mixture of 15 cc. of glacial acetic acid and 15 cc. of distilled water, boil gently for 5 minutes, filter, wash the insoluble residue with diluted acetic acid and dry to constant weight at 110°C .: the weight of the residue is not more than 10.0 mg. (0.50 per cent).

Volatile substances—Weigh accurately about 5 Gm. and heat strongly in a covered porcelain crucible: the loss in weight does not exceed 2 per cent of the weight of the oxide taken.

Alkali and earths—Completely precipitate the lead from the filtrate obtained in the test for *insoluble in acetic acid* by passing into it hydrogen sulfide, filter, and wash the precipitate with 20 cc. of distilled water. To one-half of the mixed filtrate and washings add 5 drops of sulfuric acid, evaporate to dryness, and ignite: the weight of the residue does not exceed 5.0 mg. (0.50 per cent).

Lead Nitrate, $\text{Pb}(\text{NO}_3)_2$ —Colorless or white crystals or a white crystalline powder. Very soluble in water; very slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Chloride—The chloride in 2 Gm., acidulating the solution with 5 drops of nitric acid, corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 645.

Copper and iron—Dissolve 5 Gm. in about 40 cc. of distilled water, add 5 cc. of sulfuric acid, evaporate, and heat until fumes of SO_3 are evolved. Cool, mix with about 50 cc. of distilled water, filter, and wash the precipitate with 20 cc. of distilled water. Divide the filtrate into 2 equal portions for the following tests:

Copper—Heat one-half of the filtrate to boiling, add a slight excess of ammonia T.S., and filter. Acidify the filtrate with acetic acid and add 2 cc. of freshly prepared potassium ferrocyanide T.S.: no red color should be produced in 10 minutes (about 20 parts per million of Cu).

Iron—To the second half of the filtrate, add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S.: any red color produced is not greater than is produced by 0.05 mg. of Fe under the same conditions (20 parts per million of Fe).

Substances not precipitated by hydrogen sulfide—Dissolve 2 Gm. in 100 cc. of distilled water and pass hydrogen sulfide gas through the solution to precipitate the lead completely. Filter, and to 50 cc. of the filtrate add 5 drops of reagent sulfuric acid, evaporate to dryness, and ignite: the weight of the ignited residue should not exceed 1.0 mg. (0.10 per cent).

Lead Subacetate (*Basic Lead Acetate*), $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{Pb}(\text{OH})_2$ —A heavy, white powder, readily absorbing carbon dioxide from the air. It is soluble in water, usually incompletely; slightly soluble in alcohol.

Assay for lead—Weigh accurately about 1 Gm. of lead subacetate in a porcelain crucible, add about 0.5 cc. of sulfuric acid, and ignite to constant weight. The weight of the lead sulfate corresponds to not less than 70 per cent and not more than 73 per cent of Pb.

Insoluble in acetic acid—Dissolve 6 Gm. in 100 cc. of distilled water and 5 cc. of glacial acetic acid, warming if necessary. If an insoluble residue remains, filter and wash with distilled water until the washings are no longer darkened by hydrogen sulfide. Dry to constant weight at from 105° to 110° C.: the weight of the residue does not exceed 3.0 mg. (0.05 per cent).

Chloride—1 Gm. shows no more chloride than corresponds to 0.05 mg. of Cl (0.005 per cent), page 645.

Solution A—Dissolve 5 Gm. in a mixture of 42 cc. of distilled water and 3 cc. of glacial acetic acid. Add 5 cc. of sulfuric acid, allow to stand for 10 minutes, and filter.

Nitrate—To 10 cc. of Solution A add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color does not disappear in 5 minutes (0.003 per cent NO_3).

Copper—To 25 cc. of Solution A, add stronger ammonia T.S. until barely alkaline, heat on steam bath for 10 minutes, and add 10 cc. of stronger ammonia T.S. No blue color should be observed in the solution when compared with an equal volume of distilled water (about 50 parts per million of Cu).

Iron—Dissolve 2 Gm. in 5 cc. of distilled water, add 2 cc. of sulfuric acid, heat until the sulfuric acid fumes, and cool. Dilute with distilled water to 30 cc. and filter. To 15 cc. of the filtrate add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color produced should not be more than that produced under the same conditions by 0.05 mg. of Fe (50 parts per million).

Substances not precipitated by hydrogen sulfide—Dilute 10 cc. of Solution A with distilled water to 100 cc., pass in hydrogen sulfide gas to precipitate all of the lead, and filter. Evaporate 50 cc. of the filtrate to dryness and ignite gently to constant weight: the weight of the residue does not exceed 1.5 mg. (0.30 per cent).

Keep in tightly closed containers.

Lime (*Calcium Oxide*), CaO —Hard, white or grayish white masses or granules, or a white powder; odorless.

Assay—Ignite about 1 Gm. of lime to constant weight over a blast lamp, weigh accurately, add 50 cc. of distilled water and follow cautiously with 20 cc. of diluted hydrochloric acid. Cool the solution, dilute with distilled water to exactly 100 cc.,

and mix well. Transfer 20 cc. of this solution to a 200-cc. volumetric flask, add 100 cc. of tenth-normal oxalic acid, make alkaline with ammonia T.S., shake the mixture well, and allow it to stand for 3 hours at from 60° to 70° C., or over night, at room temperature. Cool if necessary, make up to the mark with distilled water, mix well, filter through a filter which has not been previously moistened, into a dry flask and reject the first 20 cc. of filtrate. Acidulate 100 cc. of the filtrate with diluted sulfuric acid, then add 25 cc. more of the diluted sulfuric acid, warm the solution to about 80° C., and titrate the excess of oxalic acid with tenth-normal potassium permanganate to a faint pink color. Each cc. of tenth-normal oxalic acid is equivalent to 0.002804 Gm. of CaO. It shows not less than 95 per cent of CaO.

Insoluble matter—Slake 5 Gm. of lime with 100 cc. of distilled water. Add hydrochloric acid, drop by drop, with agitation, until all of the lime is dissolved, then add 1 cc. more of the acid. Boil, filter, wash thoroughly with hot distilled water, and dry at 105° C. The weight of the insoluble residue does not exceed 50.0 mg. (1 per cent).

Carbonate—Slake 1 Gm. of lime, thoroughly mix with 50 cc. of distilled water, allow to settle, and decant the milky liquid: the addition of an excess of diluted hydrochloric acid to the residue causes not more than a slight effervescence.

Loss on ignition—Transfer about 1 Gm. of lime, accurately weighed, to a tared platinum crucible and ignite to constant weight with a blast lamp. The loss in weight does not exceed 10 per cent.

Magnesium and alkalis—Mix 1.0 Gm. of the lime with 75 cc. of distilled water, add hydrochloric acid, drop by drop, until all of the lime is dissolved, and then add 1 cc. of the acid in excess. Boil the solution for a few minutes, neutralize with ammonia T.S., and add sufficient hot ammonium oxalate T.S. to precipitate all of the calcium. Allow to stand on a water bath for 2 hours, cool, dilute with distilled water to 150 cc., mix well, and filter. To 50 cc. of the filtrate add 10 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 20 mg. (about 2 per cent as MgO).

Keep in moisture-proof and air-tight containers.

Lime, Freshly Slaked, $\text{Ca}(\text{OH})_2$ —To prepare freshly slaked lime, add slowly to a convenient quantity of reagent lime one-third of its weight of distilled water, cover, and allow to stand until it has been converted into a pulverulent mass and is cool.

Litmus, Lacmus, Lackmus, Turnsole, Lacqueblue—A blue pigment prepared from various species of *Rocella* DeCandolle, *Lecanora* Acharius, or other lichens (Fam. *Parmeliaceae*).

Description—Cubes, masses, fragments, or granules, of an indigo blue or deep violet color. It has the combined odor of indigo and violets, tinges the saliva a deep blue, and is somewhat pungent and saline to the taste. The indicator substances contained in litmus are soluble in water and less soluble or insoluble in alcohol.

Ash—Litmus yields not more than 60 per cent of ash.

Magnesium Chloride, $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ —White, deliquescent crystals, very soluble in water.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 645.

Nitrate—Dissolve 2 Gm. in 10 cc. of distilled water, add 0.1 cc. of indigo carmine

T.S. and 10 cc. of reagent sulfuric acid. The blue color should not entirely disappear in 5 minutes (about 0.002 per cent NO_3).

Phosphate—To 10 Gm. add 15 cc. of nitric acid and evaporate to a small volume. Treat with a mixture of 5 cc. of nitric acid and 40 cc. of distilled water, and add ammonia T.S. until a precipitate begins to form. Clear the solution by adding sufficient nitric acid, and then add 50 cc. of ammonium molybdate T.S. Shake the mixture for 5 minutes at a temperature of 40°C . and allow to stand for 1 hour. Any yellow precipitate produced is not greater than that produced by 0.05 mg. of PO_4 in an equal volume of solution containing as nearly as possible the same quantities of the same reagents used in the test (0.0005 per cent PO_4).

Sulfate—The sulfate in 2 Gm. corresponds to not more than 0.04 mg. of SO_4 (0.002 per cent), page 645.

Alkali salts—Dissolve 2 Gm. in 10 cc. of 95 per cent alcohol: no residue or turbidity should be evident. If the solution is clear, evaporate it to dryness on a water bath: the residue should dissolve completely in 10 cc. of 95 per cent alcohol (about 0.1 per cent).

Ammonia—Dissolve 2 Gm. in 90 cc. of distilled water and add 10 cc. of 10 per cent sodium hydroxide solution. Allow to settle and decant 50 cc., add 2 cc. of Nessler's reagent. The color is not greater than that produced by 0.02 mg. of NH_3 in 45 cc. of distilled water, 5 cc. of the sodium hydroxide solution, and 2 cc. of Nessler's reagent (0.002 per cent NH_3).

Barium—Dissolve 1 Gm. in 10 cc. of distilled water and add 1 cc. of normal sulfuric acid. At the end of 30 minutes the solution should not be more turbid than a similar solution to which no sulfuric acid has been added (about 0.005 per cent Ba).

Calcium—Dissolve 2.5 Gm. in 50 cc. of 95 per cent alcohol, add 25 cc. of diluted sulfuric acid (1 in 5), and allow to stand over night: no precipitate or turbidity should be produced. If crystals separate, warm the solution slightly (about 0.01 per cent Ca).

Heavy metals—The heavy metals limit for Magnesium Chloride is 5 parts per million, using 3 Gm. for the test, page 646.

Iron—Dissolve 2 Gm. in 25 cc. of distilled water, heat to boiling, add 5 drops of nitric acid, boil for a few minutes, cool, and dilute to 25 cc. Add 2 cc. of reagent hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color developed should be not greater than that produced by 0.01 mg. of Fe in the same volume of solution containing the same quantities of the same reagents used in the test (5 parts per million).

Magnesium Oxide, MgO —Use *Magnesii Oxidum*, page 281.

Magnesium Sulfate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ —Use *Magnesii Sulfas*, page 284.

Manganese Sulfate, $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$ or $\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$ —Pink crystals. Very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Water of hydration—Weigh accurately about 2 Gm., heat it at 150°C . for two hours, and ignite to constant weight at from 400° to 500°C .: the loss in weight is from 32 to 38 per cent.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.05 mg. of Cl (0.005 per cent), page 645.

Alkali and earths—Dissolve 2 Gm. in about 90 cc. of distilled water and add sufficient ammonium sulfide T.S. to precipitate the manganese completely. Heat on a water bath for about 30 minutes, cool, dilute with distilled water to 100 cc., mix well, and filter. Evaporate 50 cc. of the filtrate to dryness and ignite the residue to constant weight: the weight of the residue does not exceed 2.5 mg. (0.25 per cent).

Heavy metals—Dissolve 1 Gm. of manganese sulfate in 20 cc. of distilled water and add 1 cc. of normal hydrochloric acid. Dissolve 1 Gm. of the manganese sulfate in 10 cc. of distilled water, add 1 cc. of normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no difference in color should be noticeable between the two solutions.

Iron—Dissolve 1 Gm. in 15 cc. of distilled water, add 3 drops of nitric acid and heat to boiling. Cool and dilute with distilled water to 25 cc., add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color developed should not be darker than that produced by 0.02 mg. of Fe in an equal volume of solution treated with the same quantities of the same reagents used in the test (20 parts per million).

Zinc—Dissolve 1 Gm. in 20 cc. of distilled water and to 10 cc. of the solution add 10 cc. of hydrogen sulfide T.S.: no turbidity, which can be cleared up by hydrochloric acid, is produced in 2 minutes.

Substances reducing permanganate—Mix 200 cc. of distilled water with 3 cc. of sulfuric acid and 3 cc. of phosphoric acid and add tenth-normal potassium permanganate until a slight pink color is produced. Disregard the volume of potassium permanganate used. Then dissolve in the mixture 10 Gm. of manganese sulfate and add 0.10 cc. of tenth-normal potassium permanganate: the pink color persists for not less than 1 minute.

Mercuric Bromide, HgBr_2 —White or faintly yellow crystals or a crystalline powder. Slightly soluble in cold water, soluble in boiling water, soluble in alcohol.

Residue on ignition—Ignite 5 Gm. with 2 cc. of sulfuric acid to constant weight: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Insoluble in methanol—Dissolve 2 Gm. in 30 cc. of methanol. If an insoluble residue remains, filter through asbestos in a Gooch crucible, wash with methanol until the washings remain unaffected by hydrogen sulfide and dry at from 105° to 110° C. The weight of the residue does not exceed 2.0 mg. (0.10 per cent).

Chloride—Weigh accurately about 0.7 Gm. and moisten with 5 cc. of distilled water and 1 cc. of acetic acid. Add 5 Gm. of coarsely powdered zinc (20 to 30 mesh) and warm gently, shaking frequently until the supernatant liquid becomes clear (about 10 minutes). Filter, wash, and to the combined filtrate and washings, add 2 cc. of ferric ammonium sulfate T.S., 3 cc. of nitric acid, and 50 cc. of tenth-normal silver nitrate. Filter, wash, and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate. The volume of silver nitrate consumed corresponds to not more than 55.9 cc. per Gm. of mercuric bromide (about 0.5 per cent Cl).

Mercuric Chloride—Use *Hydrargyri Bichloridum*, page 210.

Mercuric Iodide, Red, HgI_2 —A scarlet red powder. Insoluble in water; sparingly soluble in alcohol or ether; readily dissolved by solutions of alkali iodides.

Assay—Weigh accurately about 0.2 Gm. of Red Mercuric Iodide, previously dried for 18 hours over sulfuric acid, and transfer it completely to a glass-stoppered

flask. Add a cooled mixture of 30 cc. of hydrochloric acid, 20 cc. of distilled water and 5 cc. of chloroform. Rotate the flask until the mercuric iodide dissolves, then titrate the solution with twentieth-molar potassium iodate until the iodine color disappears from the aqueous layer. Stopper the flask, shake thoroughly for 30 seconds, then continue the titration, shaking vigorously after each addition of the iodate solution until the iodine color just disappears from the chloroform. Each cc. of twentieth-molar potassium iodate is equivalent to 0.02272 Gm. of HgI_2 and not less than 99 per cent of HgI is found.

Residue on ignition—Not more than 0.1 per cent.

Solubility in potassium iodide—A 10-Gm. portion dissolves completely or practically so in a solution of 10 Gm. of potassium iodide in 100 cc. of distilled water.

Mercurous mercury—To the solution resulting from the preceding test and contained in a glass-stoppered flask, add 5 cc. of tenth-normal iodine and 3 cc. of normal hydrochloric acid. Allow to stand in the dark for 1 hour with frequent agitation, then titrate the excess of iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Not more than 0.5 cc. of the tenth-normal iodine is consumed, correction being made for any iodine consumed in a blank test (0.1 per cent mercurous Hg).

Soluble mercury salts—Shake 1 Gm. with 25 cc. of distilled water for 2 minutes, filter, and add to the filtrate 10 cc. of hydrogen sulfide T.S. If a color is produced, it is not darker than a blank to which 0.70 mg. of mercury bichloride has been added (about 0.05 per cent as Hg).

Mercuric Oxide, Yellow, HgO —Use *Hydrargyri Oxidum Flavum*, page 212.

Mercurous Chloride, Mild, HgCl —Use *Hydrargyri Chloridum Mite.*, page 211.

Mercurous Nitrate, (HgNO_3 , about $1\text{H}_2\text{O}$)—Colorless crystals. Soluble in a small amount of water, but decomposed by much water into the basic salt.

Insoluble matter—Dissolve 2 Gm. in 20 cc. of diluted nitric acid: the resulting solution is clear and complete.

Residue on ignition—Ignite 2 Gm.: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Dissolve 3 Gm. in 10 cc. of diluted nitric acid. Add to the solution, with stirring, 15 cc. of 10 per cent sodium hydroxide solution and digest on a water bath for 1 hour. Dilute to 30 cc. with distilled water, cool, and filter. Use this solution in the following tests:

Chloride—A 10-cc. portion of the above filtrate shows no more chloride than corresponds to 0.1 mg. of Cl (0.01 per cent), page 645.

Sulfate—Another 10-cc. portion of the above filtrate shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.01 per cent), page 645.

Mercuric mercury—Dissolve 1 Gm. in 5 cc. of diluted nitric acid, dilute with 45 cc. of distilled water and add, with stirring, 1 cc. of hydrochloric acid. Filter, and to 10 cc. of the filtrate add 10 cc. of hydrogen sulfide T.S. The resulting color is not darker than that produced in a control made with 1.5 mg. of mercuric chloride in an equal volume of solution made with the same quantities of the same reagents used in the test (0.55 per cent of mercuric Hg).

Mercury, Hg—Use *Hydrargyrum*, page 215.

Mercury Bichloride, HgCl_2 —Use *Hydrargyri Bichloridum*, page 210.

Metaphenylenediamine Hydrochloride, $\text{C}_6\text{H}_4(\text{NH}_2)_2 \cdot 2\text{HCl}$ —A white or slightly reddish white crystalline powder, easily soluble in water. On exposure to light it acquires a reddish color.

Solubility—A solution of 1 Gm. in 200 cc. of distilled water is colorless.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.10 per cent).

Keep protected from light.

Methanol, CH_3OH —A clear, colorless liquid, miscible with water, alcohol, and with ether; a characteristic odor; inflammable.

Assay—The specific gravity is not more than 0.791 at 25°C ., corresponding to not less than 99.5 per cent by volume of CH_3OH .

Solubility in water—Mix 15 cc. with 45 cc. of distilled water and allow to stand for 1 hour; the solution is as clear as an equal volume of the water.

Boiling range—Determine by method II, on page 559: not less than 95 per cent distils between 64° and 67°C .

Non-volatile matter—Evaporate 120 cc. on a water bath and dry the residue at from 105° to 110°C . for 30 minutes: the weight of the residue does not exceed 1.0 mg. (0.001 per cent).

Acidity—Mix 10 cc. of methanol with 25 cc. of distilled water, add 0.5 cc. of phenolphthalein T.S. and fiftieth-normal sodium hydroxide until a slight pink color is produced which persists after shaking for 30 seconds. Add to this mixture 25 cc. of the methanol, mix well, and add fiftieth-normal sodium hydroxide to the production of a slight pink color; the second titration requires not more than 0.5 cc. of the sodium hydroxide.

Alkalinity—Dilute 25 cc. with 25 cc. of distilled water and add 1 drop of methyl red T.S.: not more than 0.20 cc. of fiftieth-normal sulfuric acid should be required to produce a pink color (0.0003 per cent as NH_3).

Acetone, aldehydes—To 1 cc. of methanol add 4 cc. of distilled water and 5 cc. of Nessler's reagent. Any resulting turbidity is not greater than that produced by 0.030 mg. of acetone in 5 cc. of distilled water and 5 cc. of Nessler's reagent (0.003 per cent as acetone).

Ethyl alcohol—Dilute 5 cc. with 15 cc. of distilled water, add 5 cc. of normal sodium hydroxide. Add slowly, with stirring, 15 cc. of tenth-normal iodine and keep the mixture at about 40°C . for 30 minutes. The mixture is as free from turbidity or yellow color as a blank made with 20 cc. of distilled water and the same quantities of sodium hydroxide and tenth-normal iodine as used in the test (about 1 per cent of $\text{C}_2\text{H}_5\text{OH}$).

Substances reducing permanganate—Cool 20 cc. to 15°C ., add 0.1 cc. of tenth-normal potassium permanganate, and allow to stand at 15°C . for 5 minutes: the pink color should not entirely disappear.

Substances darkened by sulfuric acid—Cool 10 cc. of reagent sulfuric acid, contained in a small Erlenmeyer flask, to 10°C . and add, drop by drop with constant agitation, 10 cc. of methanol. The resulting mixture should not have more than a slight, brown color.

Methylene Blue—Use *Methylthioninæ Chloridum*, page 296.

Molybdic Anhydride (*Molybdenum Trioxide*), MoO_3 —A slightly yellowish powder. Slightly soluble in water, soluble in ammonia T.S. and in solutions of alkali hydroxides.

Assay—Weigh accurately about 0.5 Gm. and dissolve with heat in a mixture of 50 cc. of distilled water and 3 cc. of dilute ammonia T.S. Add 5 cc. of acetic acid, and dilute with distilled water to about 200 cc. Heat to boiling, and add a clear solution of 1.5 Gm. of lead acetate in 20 cc. of distilled water. Boil for several minutes with stirring until the precipitate becomes granular and settles readily. Decant the supernatant liquid through ignited asbestos in a Gooch crucible, wash the precipitate by decantation 10 times with 50-cc. portions of boiling distilled water, then transfer the precipitate to the crucible, dry, ignite, and weigh as PbMoO_4 . The weight of the lead molybdate, multiplied by 0.3922, represents the MoO_3 , which corresponds to not less than 99.5 per cent.

Insoluble in ammonia water—Dissolve 10 Gm. by heating on a water bath with a mixture of 30 cc. of distilled water and 20 cc. of stronger ammonia T.S. Filter through asbestos in a Gooch crucible, wash, and dry at from 105° to 110°C. : the weight of the insoluble residue does not exceed 1.0 mg. (0.01 per cent). (NOTE—Reserve the filtrate separately from the washings for the phosphate test.)

Chloride—Digest 1.5 Gm. with 20 cc. of distilled water and 10 cc. of nitric acid for 15 minutes and filter. To 20 cc. of the filtrate add 1 cc. of silver nitrate T.S. Any resulting turbidity is not greater than that produced by 0.02 mg. of chloride ion in an equal volume of solution made with the same quantities of the same reagents used in the test (0.002 per cent Cl).

Nitrate—Triturate 1 Gm. with 10 cc. of distilled water containing 5 mg. of sodium chloride. Add 0.2 cc. of indigo carmine T.S. and 10 cc. of reagent sulfuric acid. The blue color is not completely discharged in 5 minutes (about 0.003 per cent NO_3).

Phosphate—Pour the filtrate (without the washings) obtained in the test for *insoluble in ammonia water* into a mixture of 60 cc. of nitric acid and 60 cc. of distilled water. Shake the mixture for 5 minutes at 40°C. , and allow to stand for 1 hour. Any precipitate should not be greater than that produced in a blank prepared by treating 2 Gm. of the Molybdic Anhydride and 0.04 mg. of phosphate (PO_4) with the same quantities of reagents and in the same manner as in the test (0.0005 per cent of PO_4).

Sulfate—Boil 1 Gm. with a mixture of 5 cc. of nitric acid and 10 cc. of distilled water for 5 minutes. Cool, dilute to 50 cc., mix well, and filter. Evaporate 10 cc. of the filtrate to dryness on a water bath, moisten the residue with 3 drops of hydrochloric acid, add a few cc. of distilled water, warm, dilute with distilled water to 25 cc., and filter. The filtrate shows no more sulfate than corresponds to 0.04 mg. of SO_4 (0.02 per cent), page 645.

Ammonia—Dissolve 0.5 Gm. in 10 cc. of 10 per cent solution of sodium hydroxide, dilute to 50 cc. with distilled water, and add 3 cc. of Nessler's reagent. The color is not greater than that produced by 0.05 mg. of NH_3 (in the form of ammonium salt) in an equal volume of solution made with the same quantities of the same reagents used in the test (0.01 per cent of NH_3).

Heavy metals—Dissolve 1 Gm. in 15 cc. of 10 per cent solution of sodium hydroxide, add 2 cc. of ammonia T.S., and dilute to 50 cc. with distilled water. To 10 cc. of the diluted solution add 3 cc. of hydrogen sulfide T.S. Any resulting brown color should not be greater than that produced in a blank by 0.01 mg. of Pb (50 parts per million).

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β -Naphthylamine Acetate, $C_{10}H_7NH_2.HC_2H_3O_2$ —White to yellowish white crystalline scales or flakes. Very soluble in water and in alcohol; soluble in ether.

α -Naphthylamine—An aqueous solution (1 in 100) does not give a violet color with 5 drops of ferric chloride T.S.

α -Naphthylamine Hydrochloride, $C_{10}H_7NH_2.HCl$ —A white crystalline powder which turns bluish upon exposure to light and air. Soluble in water, in alcohol, and in ether.

An aqueous solution (1 in 100), made slightly acid with acetic acid, gives a violet color with 5 drops of ferric chloride T.S. A solution (1 in 40) in diluted acetic acid is colorless and not more than slightly opalescent.

Residue on ignition—Ignite 2 Gm.; the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Nitric Acid, Reagent, HNO_3 —A clear, colorless liquid.

Assay—When assayed by the method outlined under *Acidum Nitricum*, page 26, it contains not less than 68 per cent and not more than 71 per cent of HNO_3 .

Non-volatile matter—Evaporate 70 cc. of the acid to dryness in a platinum dish, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue does not exceed 0.5 mg. (0.0005 per cent).

Chloride—Dilute 5 cc. of the acid with an equal volume of distilled water and add 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that produced by 0.005 mg. of chloride ion in 9 cc. of distilled water to which are added 1 cc. of dilute nitric acid (1 volume of reagent nitric acid with 9 volumes of distilled water) and 1 cc. of tenth-normal silver nitrate (0.00007 per cent Cl).

Sulfate—Add about 0.01 Gm. of sodium carbonate to 18 cc. of the acid and evaporate to dryness on a water bath. The residue, dissolved in 25 cc. of distilled water, shows no more sulfate than corresponds to 0.05 mg. of SO_4 (0.0002 per cent), page 645.

Arsenic—Mix 70 cc. of the acid with 3 cc. of reagent sulfuric acid and evaporate until fumes of SO_3 are copiously evolved. Cool, cautiously dilute with 10 cc. of distilled water, adding 10 cc. of sulfuric acid, re-evaporate to the evolution of fumes of SO_3 and then test for arsenic, page 554: the stain produced corresponds to not more than 0.003 mg. of As (0.03 parts per million).

Heavy metals—Evaporate 7 cc. (10 Gm.) to dryness on a steam bath. Warm the residue with 2 cc. of diluted acetic acid and 15 cc. of distilled water and dilute to 30 cc. The heavy metals limit for nitric acid is 3 parts per million.

Iron—Evaporate 7 cc. (10 Gm.) to dryness on a steam bath. Add to the residue 2 cc. of hydrochloric acid, dilute with distilled water to 20 cc. and add 2 cc. of ammonium thiocyanate T.S.: any red color produced corresponds to not more than 0.01 mg. of Fe (1 part per million).

Nitric Acid, Diluted, (10 per cent HNO_3)—Dilute 105 cc. of reagent nitric acid with sufficient distilled water to make 1000 cc.

Nitric Acid, Fuming—A yellowish red to brownish red, fuming liquid. Specific gravity: about 1.50, at 25° C. It conforms to the tests for purity under *Acidum Nitricum*, page 26.

Oil of Cedar—(For clearing microscope sections). A selected, commercial distilled oil from the wood of the red cedar, *Juniperus virginiana* Linné (Fam. *Pinacæ*) should be used for this purpose. Refractive index: about 1.504 at 20° C. For use with homogeneous immersion lenses, a specially prepared oil is required having a refractive index of exactly 1.515 at 18° C.

Orange G (The sodium salt of azo-benzene-beta-naphthol disulfonic acid), $C_6H_5.N:N.C_{10}H_4(OH)(SO_3Na)_2$ (2,6,8)—Orange to brick red powder or dark red crystals; readily soluble in water, yielding an orange yellow solution, slightly soluble in alcohol, insoluble in ether or chloroform. The addition of tannic acid T.S. to an aqueous solution of Orange G (1 in 500) causes no precipitation (*acid color*). The addition of hydrochloric acid to a mixture of 0.5 Gm. of zinc dust and 10 cc. of an aqueous solution of the color (1 in 500) produces decolorization. When filtered, the colorless filtrate, on standing exposed to the air, does not regain its original color (*presence of azo-group*). When heated, Orange G does not deflagrate (distinction from *nitro colors*). The addition of barium or calcium chloride T.S. to a concentrated aqueous solution of Orange G produces a colored, crystalline precipitate. The addition of hydrochloric acid to an aqueous solution of the dye (1 in 500) produces no change; the addition of sodium hydroxide T.S. to a similar solution produces a yellowish red to a bordeaux color but no precipitation. Orange G dissolves in sulfuric acid with an orange to yellowish red; no change in color results upon diluting the solution cautiously with distilled water.

Ortho-Phenanthroline, $C_{12}H_8N_2 \cdot H_2O$ —White or grayish white, odorless crystals or crystalline powder. Melts between 93° and 95° C. Sparingly soluble in water; soluble in alcohol, or acetone.

Residue on ignition—Ignite 0.1 Gm.: the residue is negligible.

Sensitiveness—Dissolve 0.15 Gm. of ortho-phenanthroline in 10 cc. of a solution of ferrous sulfate, prepared by dissolving 1.48 Gm. of clear crystals of ferrous sulfate in 100 cc. of distilled water. The ferrous sulfate solution must be prepared immediately before dissolving the ortho-phenanthroline in it. Add 0.1 cc. of this solution to 100 cc. of oxygen-free distilled water previously mixed with 5 cc. of diluted sulfuric acid, then add 0.05 cc. of tenth-normal ceric sulfate. The red color of the solution should change to pale blue.

Oxalic Acid, $H_2C_2O_4 \cdot 2H_2O$ —White crystals, soluble in water, very soluble in boiling water and in alcohol; slightly soluble in ether.

Insoluble—Dissolve 10 Gm. in 200 cc. of hot distilled water: the weight of the insoluble residue does not exceed 1.0 mg. (0.01 per cent), page 645.

Residue on ignition—Ignite 5 Gm.: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Chloride—Dissolve 5 Gm. in 75 cc. of distilled water, add 15 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any resulting turbidity is not greater than that produced by 0.1 mg. of chloride ion in an equal volume of solution made with the same quantities of the same reagents used in the test (0.002 per cent).

Nitrogen compounds—Dissolve 2 Gm. in 20 cc. of distilled water in a flask, add 40 cc. of 10 per cent solution of sodium hydroxide, cooling with ice while adding the sodium hydroxide. Add about 0.5 Gm. of aluminum wire or foil in small pieces, protect from the absorption of ammonia by covering the flask or closing it with a

stopper carrying a long thin tube, and allow it to stand for about 4 hours, agitating it occasionally. Dilute with distilled water to 100 cc., decant 50 cc. of the clear liquid, and add 2 cc. of Nessler's reagent: any resulting color is not greater than that produced in a control test with a quantity of an ammonium salt corresponding to 0.01 mg. of nitrogen (0.001 per cent as N).

Sulfate—Dissolve 2 Gm. in 20 cc. of warm distilled water, add ammonia T.S. to a slight alkaline reaction, and add about 1 Gm. of sodium carbonate. Evaporate to dryness in a porcelain dish and gently ignite the residue with a sulfur-free flame until no more fumes are evolved. Cool, add 10 cc. of distilled water and 1 cc. of bromine T.S., and heat on a water bath for 15 minutes. Add 3 cc. of hydrochloric acid and evaporate to dryness on the steam bath. The residue dissolved in 25 cc. of distilled water shows no more sulfate than a blank to which 0.10 mg. of SO_4 has been added (0.005 per cent).

Heavy metals—To the residue from the test for *residue on ignition* add 1 cc. of hydrochloric acid and 5 drops of nitric acid, evaporate to dryness on a steam bath, and dissolve the residue in 25 cc. of distilled water. Use 10 cc. of the solution for testing for heavy metals. The heavy metals limit for ammonium oxalate is 10 parts per million.

Iron—Dilute 10 cc. of the solution from the preceding test to 25 cc. with distilled water, add 2 cc. of hydrochloric acid and 2 cc. of ammonium cyanate T.S.: any red color produced is not darker than that produced by 0.010 mg. of Fe (5 parts per million).

Substances darkened by hot sulfuric acid—Heat 1 Gm. of the oxalic acid with 10 cc. of reagent sulfuric acid in a previously ignited test tube until fumes of SO_3 are evolved. At most, only a faint coloration should be produced.

Palladous Chloride, PdCl_2 —Dark brown, hygroscopic powder. Its aqueous solution is turbid due to the formation of a basic salt, but dissolves clearly on adding hydrochloric acid.

Assay—Weigh accurately about 0.2 Gm. of palladous chloride, dissolve it, by warming, in 5 cc. of diluted hydrochloric acid and dilute to 200 cc. with distilled water. Add to the solution 50 cc. of an alcoholic solution of dimethylglyoxime (1 Gm. in 100 cc.) and heat on a water bath for 1 hour. Filter while warm, wash the residue with warm distilled water, and ignite: the weight of the palladium metal thus obtained corresponds to not less than 59 per cent of the weight of the palladous chloride taken for the assay.

Peptone, Dried (Meat Peptone)—A reddish yellow to brown powder, with characteristic but not putrescent odor. It is soluble in water, forming a yellowish brown solution having a slight acid reaction. It is insoluble in alcohol or in ether.

Nitrogen content—Determine the nitrogen content by the Kjeldahl method, page 598, in the peptone previously dried to constant weight at 100°C . It shows not less than 14.2 per cent and not more than 15.5 per cent of nitrogen (N), corresponding to a minimum of 89 per cent protein.

Residue on ignition—Weigh accurately about 0.5 Gm. and heat slowly until it is thoroughly charred. Cool, add 1 cc. of sulfuric acid, and ignite to constant weight: the weight of the residue corresponds to not more than 5 per cent of the peptone taken for the test.

Loss at 100°C .—Weigh accurately about 1 Gm. of peptone and dry to constant

weight at 100° C.: the loss in weight corresponds to not more than 7 per cent of the original peptone.

Coagulable protein—Upon heating a filtered aqueous solution (1 in 20) to boiling, no precipitate forms.

Proteoses—Mix 5 cc. of a filtered aqueous solution (1 in 10) with 20 cc. of a filtered solution of zinc sulfate (made by dissolving 50 Gm. of the salt in 35 cc. of distilled water): not more than a slight, flocculent precipitate is formed.

Perchloric Acid, HClO_4 —A colorless, clear liquid. Miscible with water. It is very caustic and may deflagrate on contact with oxidizable substances.

Assay—Weigh about 3 cc. of the acid, dilute with 50 cc. of distilled water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as indicator. It shows not less than 60 per cent of HClO_4 .

Non-volatile matter—Evaporate 12 cc. of the acid and ignite. The weight of the residue does not exceed 1 mg. (about 0.005 per cent).

Chloride—The chloride in 5 cc. of the acid corresponds to not more than 0.08 mg. of Cl (0.001 per cent), page 645.

Nitrogen compounds—Dilute 1 cc. of the acid with 40 cc. of distilled water in a Kjeldahl distilling flask. Add 15 cc. of 10 per cent sodium hydroxide solution and 1 Gm. of powdered Devarda's metal. Allow to stand for 1 hour, then distil 30 cc. into 5 cc. of distilled water containing 1 drop of hydrochloric acid. Dilute the distillate with distilled water to 50 cc., add 2 cc. of 30 per cent sodium hydroxide and 2 cc. of Nessler's reagent. The color is not darker than that produced by treating 0.045 mg. of nitrogen (as NH_4Cl) in the same manner (0.003 per cent as N).

Sulfate—Dilute 2 cc. of the acid with 20 cc. of distilled water, neutralize with ammonia T.S., add 0.3 cc. of hydrochloric acid, and dilute with distilled water to 30 cc., then add 3 cc. of barium chloride T.S. If a turbidity is produced, it corresponds to not more than 0.015 mg. of SO_4 (0.005 per cent), page 645.

Heavy metals—Mix 2.0 cc. of the acid with 30 cc. of distilled water, neutralize with ammonia T.S., using litmus paper as indicator, then add 1 drop of the acid and 5 cc. of hydrogen sulfide T.S.: no brown color is produced.

Phenol—Use *Phenol*, page 357.

Phenylhydrazine, $\text{C}_6\text{H}_5\cdot\text{NH}\cdot\text{NH}_2$ —Colorless, or slightly yellowish, highly refractive liquid.

Congeaing point—Determine by the method described on page 566; it is not below 16° C.

Insoluble matter—Shake 1 cc. with 20 cc. of diluted acetic acid: the resulting solution is clear or practically so.

Non-volatile matter—Ignite 1 cc. with 0.5 cc. of sulfuric acid: the weight of the residue is not more than 1.0 mg. (0.1 per cent).

Phloroglucinol, $\text{C}_6\text{H}_3(\text{OH})_3\cdot 2\text{H}_2\text{O}$ —White or yellowish white crystals or a crystalline powder. Slightly soluble in water, soluble in alcohol and in ether.

Insoluble in alcohol—Dissolve 1 Gm. in 20 cc. of alcohol: a clear and complete solution results.

Melting point—Phloroglucinol melts between 215° and 219° C., the bath being preheated to about 200° C., page 595.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: not more than 1.0 mg. of residue remains (0.10 per cent).

Diresorcinol—Heat to boiling a solution of 0.1 Gm. of phloroglucinol in 10 cc. of acetic anhydride, cool the solution and superimpose it upon 10 cc. of sulfuric acid: no violet color should appear at the zone of contact of the liquids.

Phosphoric Acid, H_3PO_4 —Use *Acidum Phosphoricum*, page 27.

Phosphorus Pentoxide (*Phosphoric Anhydride*), P_2O_5 —A white, amorphous powder; very rapidly deliquescent. Soluble in water with evolution of heat forming phosphoric acid; also soluble in alcohol. Keep in tightly-closed containers.

Caution—When making a solution, the phosphorus pentoxide must be added to the water in small portions to prevent excessive sputtering.

Assay—Weigh accurately in a glass-stoppered weighing bottle about 2 Gm. and transfer it with the aid of cold distilled water to a 300-cc. Erlenmeyer flask. Dilute with 100 cc. of distilled water and boil until the volume is reduced to about 25 cc. Cool, add 2 drops of methyl orange T.S., and titrate with normal sodium hydroxide. Each cc. of normal sodium hydroxide is the equivalent of 0.07098 Gm. of P_2O_5 . The assay indicates not less than 97 per cent of P_2O_5 .

Phosphorus trioxide—Dissolve 5 Gm. in 50 cc. of distilled water, add 0.5 cc. of tenth-normal potassium permanganate, and heat for 5 minutes on a steam bath. The pink color does not entirely disappear.

Phosphotungstic Acid, approximately $P_2O_5 \cdot 24WO_3 \cdot xH_2O$ —White or yellowish green crystals or a crystalline powder. Soluble in water, in alcohol, or in ether.

Insoluble—The insoluble matter from 5 Gm. is not more than 1.0 mg. (0.02 per cent), page 645.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.3 mg. of Cl (0.03 per cent), page 645.

Nitrate—Dissolve 0.5 Gm. in 10 cc. of distilled water, add about 10 mg. of sodium chloride, 0.1 cc. of indigo carmine T.S. and 10 cc. of reagent sulfuric acid. The blue color should not disappear within 1 minute (about 0.01 per cent NO_3).

Sulfate—The sulfate in 0.5 Gm. corresponds to not more than 0.1 mg. of SO_4 (0.02 per cent), page 645.

Ammonia—Dissolve 0.5 Gm. in 10 cc. of distilled water, add 5 cc. of 20 per cent solution of sodium hydroxide, and heat on a water bath: the escaping vapor should not turn moistened red litmus paper blue (about 0.02 per cent NH_3).

Heavy metals and iron—Dissolve 0.5 Gm. in 10 cc. of distilled water. Add ammonia T.S., drop by drop, until the precipitate which forms is just dissolved. Then add 5 drops of ammonia T.S. in excess and 5 cc. of hydrogen sulfide T.S.: no brown or green color is produced in 1 minute.

Picric Acid—Use *Trinitrophenol*, page 529.

Picrolonic Acid (*1-p-Nitrophenyl-3-methyl-4-nitropyrzolon*), $C_{10}H_8N_4O_5$ —Yellow to brownish yellow crystalline powder. Slightly soluble in water, soluble in alcohol, chloroform, ether, benzene, and in solutions of alkali hydroxides.

Melting point—Between 110° and 117° C.; the greater the purity, the higher the melting point.

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Residue on ignition (sulfated)—Not more than 0.1 per cent.

Sensitiveness—Dissolve 25 mg. of picrolonic acid in 10 cc. of warm distilled water containing 0.1 cc. of glacial acetic acid, and filter the solution if necessary. Dissolve 0.10 Gm. of reagent calcium chloride in 250 cc. of distilled water and mix well. Heat 1 cc. of the calcium chloride solution in a test tube to about 60° C., then add to it 1 cc. of the Picrolonic Acid solution: a bulky precipitate forms in 5 minutes or less.

Platinic Chloride (*Chloroplatinic Acid*), $\text{H}_2\text{PtCl}_6 \cdot 6\text{H}_2\text{O}$ —Brownish red, deliquescent crystals or crystalline masses. Very soluble in water, soluble in alcohol or in ether.

Assay—Dissolve about 0.5 Gm., accurately weighed, in 50 cc. of distilled water. Add 15 cc. of 20 per cent solution of sodium hydroxide and 2 Gm. of chloral hydrate. Heat the mixture on a water bath until all of the platinum is precipitated. Keep the liquid strongly alkaline, adding more chloral hydrate if necessary to complete the precipitation. Filter, wash with hot distilled water until the washings are nearly free of chloride, then wash with warm, 2 per cent acetic acid solution until the washings cease to give a reaction for chloride. Ignite and weigh: the weight corresponds to not less than 37 per cent of the platinic chloride taken.

Insoluble matter—Dissolve 1 Gm. in 10 cc. of distilled water: the solution is clear and of yellow color, but not red or brown. One-half Gm. also dissolves in 5 cc. of alcohol to form a clear solution.

Nitrate—Mix 2 cc. of the aqueous solution obtained in the preceding test with 2 cc. of reagent sulfuric acid and superimpose the cooled mixture upon 2 cc. of ferrous sulfate T.S. No brownish red color forms at the zone of contact of the liquids within 5 minutes (about 0.1 per cent NO_3).

Sulfate—Dilute 5 cc. of the aqueous solution obtained in the test for insoluble matter with 5 cc. of distilled water and add 1 cc. of barium chloride T.S.: no turbidity or precipitate is produced within 5 minutes (about 0.05 per cent SO_4).

Metals soluble in nitric acid—Ignite strongly 1 Gm. to volatilize all of the chlorine. Add to the residue 5 cc. of dilute nitric acid (1 in 3) and heat on a water bath for 15 minutes. Add 10 cc. of distilled water, filter, and wash the residual platinum with 5 cc. of hot distilled water. Evaporate the filtrate and washings to dryness and ignite to constant weight: the weight of the residue does not exceed 2.5 mg. (0.25 per cent).

Potassium and Sodium Tartrate, $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ —Use *Potassii et Sodii Tartras*, page 375.

Potassium Acetate, $\text{KC}_2\text{H}_3\text{O}_2$ —Use *Potassii Acetas*, page 369.

Potassium Bicarbonate, KHCO_3 —Use *Potassii Bicarbonas*, page 370.

Potassium Biphosphate (*Monopotassium Phosphate*, *Potassium Phosphate*, *Monobasic*), KH_2PO_4 —Colorless or white crystals, soluble in water; insoluble in alcohol.

Insoluble, calcium and ammonium hydroxide precipitate—Dissolve 10 Gm. in 100 cc. of distilled water, add 5 cc. of ammonium oxalate T.S., 15 cc. of ammonia T.S. and allow to stand over night. If a precipitate is formed, filter, wash, and ignite. The weight of the ignited precipitate does not exceed 1.0 mg. (0.01 per cent).

Loss on drying over sulfuric acid—Weigh accurately about 2 Gm. and dry for 24 hours over sulfuric acid: the loss in weight does not exceed 0.2 per cent.

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Loss on ignition—Ignite carefully to constant weight the dried residue obtained in the preceding test: the loss in weight is not less than 13.15 per cent and not more than 13.35 per cent.

Hydrogen-ion concentration—Prepare a fifth-molar solution and determine the pH by the use of indicators or electrometrically. The pH should lie between 4.4 and 4.7. Take 10-cc. portions of the solution in 4 test tubes and to each of 2 add 5 drops of a 0.04 per cent solution of bromophenol blue. To each of the other 2 add 5 drops of a 0.02 per cent solution of methyl red. To 1 tube with the bromophenol blue add 0.05 cc. of tenth-normal hydrochloric acid and to 1 of the tubes with methyl red add 0.05 cc. of tenth-normal sodium hydroxide. The solutions in the tubes to which acid and alkali are added should show distinct changes of color when compared with the corresponding tubes without either acid or alkali.

Chloride—The chloride from 2 Gm. corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 645.

Nitrogen compounds—Determine as directed under *Oxalic Acid*, page 694, using 20 cc. of 10 per cent sodium hydroxide solution: the color should be not greater than that produced in a control test with a quantity of an ammonium salt corresponding to 0.01 mg. of nitrogen (0.001 per cent N).

Sulfate—Dissolve 10 Gm. in 100 cc. of distilled water, add 1 cc. of hydrochloric acid, and heat to boiling. Add 5 cc. of barium chloride T.S. and allow to stand overnight: no precipitate is formed.

Heavy metals—Dissolve 2.5 Gm. in 20 cc. of distilled water and exactly neutralize with ammonia T.S., using 2 drops of phenolphthalein T.S. Add 20 cc. of normal sulfuric acid, 5 cc. of hydrogen sulfide T.S. and dilute to 50 cc. Any brown color which is immediately developed should not be greater than that produced by 0.025 mg. of Pb in an equal volume of an aqueous solution treated with the same quantity of hydrogen sulfide T.S. (10 parts per million).

Iron—Dissolve 2.7 Gm. in 50 cc. of distilled water. Dilute 20 cc. of this solution to 40 cc., add 2 cc. of stronger ammonia T.S. and 5 cc. of a freshly prepared hydrogen sulfide T.S. Any color produced should not be more than that produced by 0.020 mg. of iron in a solution of the same volume, containing 1.5 cc. of the solution of the sample and the same quantities of the same reagents used in the test.

Sodium—A 10 per cent solution, tested with a platinum wire in a flame, imparts no distinct yellow color to the flame.

Potassium Biphthalate (*Acid Potassium Phthalate*), $\text{KHC}_6\text{H}_4(\text{COO})_2$ —Colorless crystals, or a white, crystalline powder. Soluble in water, slightly soluble in alcohol.

Assay—Dry about 0.6 Gm. for 1 hour at 120°C ., cool in a desiccator over sulfuric acid which has not been previously used in a desiccator, and weigh accurately. Then transfer it completely with the aid of carbon dioxide-free distilled water into a 300-cc. flask which has been swept free from carbon dioxide. Add sufficient carbon dioxide-free distilled water to make the total volume about 50 cc. Stopper the flask and agitate the liquid until the potassium biphthalate is dissolved. Then add 3 drops of phenolphthalein T.S. and titrate with tenth-normal sodium hydroxide, free from carbonate.

Determine the quantity of sodium hydroxide required to produce the end-point by matching the color in another flask containing 3 drops of the same indicator and the same volume of solution, free from carbon dioxide. Subtract the volume re-

quired in the blank test from that used in the first titration and calculate on the basis that each cc. of tenth-normal sodium hydroxide corresponds to 0.02042 Gm. of $\text{KHC}_6\text{H}_4(\text{COO})_2$. It shows not less than 99.9 per cent and not more than 100.2 of $\text{KHC}_6\text{H}_4(\text{COO})_2$.

Insoluble—Insoluble matter from 10 Gm.: not more than 0.5 mg., page 645.

Loss at 100° C.—Crush quickly a few Gm. of potassium biphthalate and heat about 2 Gm., accurately weighed, at 100° C. for 3 hours: the loss in weight does not exceed 0.05 per cent.

Chlorine compounds—Mix 0.5 Gm. with 0.25 Gm. of sodium carbonate, moisten the mixture and ignite until thoroughly charred, avoiding an unduly high temperature. Treat with 15 cc. of distilled water and cautiously add 1 cc. of nitric acid. Filter, wash the residue with a few cc. of hot distilled water, add sufficient distilled water to make 25 cc. and then 1 cc. of silver nitrate T.S.: the turbidity produced is not greater than in a blank to which 0.015 mg. of Cl has been added (0.003 per cent), page 645.

Sulfur compounds—Mix 2 Gm. with 1 Gm. of sodium carbonate and dissolve it in distilled water. Evaporate to dryness and char thoroughly with a flame free from sulfur. Treat the residue with 25 cc. of distilled water, add a few cc. of bromine T.S., and heat on a water bath for 15 minutes. Neutralize with hydrochloric acid, adding a slight excess of acid, boil gently to expel the bromine, filter, wash with distilled water to make 25 cc., and add 2 cc. of barium chloride T.S.: any turbidity produced in 10 minutes is not greater than in a blank to which 0.12 mg. of SO_4 has been added (0.002 per cent as sulfur).

Heavy metals—Dissolve 3.5 Gm. in 30 cc. of hot water and neutralize the solution to litmus paper with dilute ammonia T.S. Dissolve in the solution 0.5 Gm. more of the potassium biphthalate and dilute with distilled water to 40 cc. To 10 cc. of the solution add a volume of standard lead solution, page 586, equivalent to 0.02 mg. of Pb, and dilute with distilled water to 30 cc. (Solution A). Then add to this solution and to the remaining 30 cc. of the solution (B) 10 cc. each of hydrogen sulfide T.S.: B is no darker than A (10 parts per million).

Iron—Add to A a volume of standard solution of ferric ammonium sulfate equivalent to 0.02 mg. of Fe, then make A and B alkaline with ammonia T.S.; B is no darker than A (10 parts per million).

Potassium Bisulfate, KHSO_4 (*for identification of glycerin*)—Fused, white, deliquescent masses or granules. Very soluble in water, to which it imparts an acid reaction to litmus. When heated it evolves SO_3 and H_2O , changing to normal potassium sulfate.

Acidity—Dissolve 4 Gm. in 50 cc. of distilled water and titrate with normal alkali, using phenolphthalein T.S. as the indicator. It contains not less than 35.0 per cent or more than 37.0 per cent calculated as H_2SO_4 .

Potassium Bromate, KBrO_3 —White crystals or a granular powder. Soluble in water, slightly soluble in alcohol.

Assay—Dry about 0.3 Gm. to constant weight. Weigh accurately about 0.10 Gm. of the dried salt, dissolve it in 25 cc. of distilled water, and add 3 Gm. of potassium iodide, followed by 3 cc. of hydrochloric acid. Allow to stand 5 minutes and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Correct for a blank, made with the same quantities of the same

reagents. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.002784 Gm. of KBrO_3 . Not less than 99.8 per cent of KBrO_3 is found.

Insoluble—The insoluble matter from 10 Gm. dissolved in 150 cc. of hot distilled water weighs not more than 1.0 mg. (0.01 per cent).

Neutrality—To a solution of 5 Gm. in 60 cc. of warm distilled water add 3 drops of phenolphthalein T.S.; no pink color is produced. Add 0.2 cc. of fiftieth-normal sodium hydroxide: a pink color is produced.

Bromide—Dissolve 4 Gm. in 80 cc. of distilled water and divide the solution into 2 equal portions. Add 5 drops of normal sulfuric acid to 1 portion. At the end of 2 minutes this solution should not be more yellow than the portion to which no acid was added (about 0.05 per cent of Br).

Nitrogen compounds—Dissolve 2 Gm. in 40 cc. of distilled water and add 10 cc. of a 10 per cent solution of sodium hydroxide and about 0.5 Gm. of aluminum wire or foil in small pieces. Allow to stand for 3 hours protected from loss or access of ammonia. To one-half of the clear liquid add 2 cc. of Nessler's reagent. The color should not be greater than that produced by treating a quantity of an ammonium salt, corresponding to 0.02 mg. of nitrogen, with the same quantities of distilled water and reagents used in the test (0.002 per cent N).

Sulfate—Evaporate 2 Gm. to dryness with 10 cc. of hydrochloric acid and repeat the evaporation with 5 cc. of the acid; the residue dissolved in 25 cc. of distilled water shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 645.

Heavy metals—Evaporate 2 Gm. with 10 cc. of hydrochloric acid to dryness on a steam bath, and repeat the evaporation with 5 cc. of hydrochloric acid. Test the residue for heavy metals as described in the *test for heavy metals in reagents*, page 646. The heavy metals limit for Potassium Bromate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.04 mg. of Fe (0.002 per cent), page 646.

Sodium—Test a warm 10 per cent solution in the flame with a platinum wire: no pronounced yellow color should be produced (about 0.02 per cent Na).

Potassium Bromide, KBr —Use *Potassii Bromidum*, page 371.

Potassium Carbonate, $\text{K}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ —Use *Potassii Carbonas*, page 372.

Potassium Carbonate, Anhydrous, K_2CO_3 —White granules or powder, very hygroscopic. Very soluble in water with the evolution of heat.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Loss on ignition—Ignite about 2 Gm., accurately weighed, at from 200° to 250°C .; the loss in weight corresponds to not more than 1 per cent.

Chloride and chlorate—Ignite 1 Gm. at a low red heat in a platinum dish. Cool, dissolve in 25 cc. of distilled water, add 3 cc. nitric acid, and filter if necessary: the solution shows no more chloride than corresponds to 0.03 mg. of Cl (0.003 per cent as Cl), page 645.

Nitrogen compounds—Determine as directed under *Oxalic Acid*, page 694, using 10 cc. of 10 per cent sodium hydroxide solution; the color produced is not greater than that produced in a control test with a quantity of an ammonium salt corresponding to 0.01 mg. of nitrogen (0.001 per cent N).

Phosphate—Dissolve 5 Gm. in 50 cc. of distilled water and add 15 cc. of nitric acid (in small portions). Nearly neutralize with ammonia T.S., add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° C. for 5 minutes, and allow to stand for 1 hour. Any yellow precipitate produced is not greater than is formed from 0.25 mg. of PO_4 in an equal volume of solution containing as nearly as possible the same quantities of the same nitric acid, ammonia T.S., and ammonium molybdate T.S. used in the test (0.005 per cent PO_4).

Sulfate—Dissolve 2 Gm. in 10 cc. of distilled water, add, drop by drop, 5 cc. of hydrochloric acid and evaporate to dryness on a water bath: the residue, dissolved in 25 cc. of distilled water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent).

Ammonia precipitate—Dissolve 10 Gm. in 50 cc. of distilled water, add an excess of sulfuric acid, evaporate and ignite gently until the residue is nearly dry. Cool, take up in about 100 cc. of distilled water, add a few drops of methyl red T.S., and add ammonia T.S. carefully until the solution is just alkaline. Boil, filter (reserve the filtrate, but not the washings, for the calcium and magnesium test), wash, ignite, and weigh: the weight of the precipitate does not exceed 1.0 mg. (0.01 per cent).

Arsenic—Test 2 Gm. for arsenic by the method described on page 554: the stain produced corresponds to not more than 0.006 mg. of As (0.0003 per cent).

Calcium and magnesium—To the filtrate obtained from the test for ammonia precipitate add 0.5 cc. of hydrochloric acid, 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S. and 25 cc. of ammonia T.S., and allow to stand over night. If any precipitate is formed, filter, wash with distilled water containing 2.5 per cent of ammonia, and dry. Mix the residue with about 20 mg. of sucrose and ignite to constant weight: the weight of the ignited residue should not exceed 1.5 mg. (0.015 per cent).

Heavy metals—Dissolve 2 Gm. in 10 cc. of distilled water, cautiously add 5 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the *test for heavy metals in reagents*, page 646. The heavy metals limit for Anhydrous Potassium Carbonate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 646.

Sodium—A 20 per cent solution tested with a platinum wire in the flame should give no distinct yellow color to the flame (about 0.02 per cent Na).

Potassium Chlorate, KClO_3 —Colorless crystals, white granules, or powder. Soluble in water, slightly soluble in alcohol.

Great caution should be observed in handling this salt as dangerous explosions are liable to occur when it is heated or subjected to concussion or to trituration with organic substances, such as cork, sugar, etc., or with charcoal, sulfur, sulfides, powdered metallic iron, or other easily oxidizable substances.

Assay—Weigh accurately about 0.1 Gm. of Potassium Chlorate, dissolve it in 10 cc. of distilled water in a 250-cc. flask, and add, from a burette, 35 cc. of acid ferrous sulfate T.S. Prepare a valve-stopper by taking a piece of rubber tubing of convenient diameter and about 5 cm. in length, place a piece of glass rod in one end, and slip the other end over a glass tube which passes through a perforated stopper of a size to fit the flask used. Cut a longitudinal slit about 15 mm. long in one side of the rubber tube about midway of its length. Insert this stopper in the flask and boil

the mixture for ten minutes. Cool the mixture, add 10 cc. of manganous sulfate T.S., and titrate the excess of ferrous sulfate with tenth-normal potassium permanganate. Conduct a blank test with another portion of 35 cc. of acid ferrous sulfate T.S., measured from a burette, and subtract the result of the former titration from that of the latter. Each cc. of tenth-normal potassium permanganate is equivalent to 0.002043 Gm. of KClO_3 . Not less than 99 per cent of KClO_3 is found.

Insoluble, calcium and magnesium—Dissolve 10 Gm. in 200 cc. of hot distilled water. Add 5 cc. of ammonium oxalate T.S., 3 cc. of ammonium phosphate T.S., and 30 cc. of stronger ammonia T.S. and allow to stand over night. If a precipitate is present, filter on asbestos, wash well with hot distilled water, ignite, and weigh. The weight of the ignited precipitate does not exceed 1 mg. (0.01 per cent N).

Chloride—Dissolve 1 Gm. in 20 cc. of warm distilled water, cool, then add 3 drops of nitric acid free from the lower oxides of nitrogen and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that of a control made with 0.02 mg. of Cl (0.002 per cent).

Nitrogen compounds—Dissolve 2 Gm. in 40 cc. of warm distilled water, cool and add 10 cc. of 10 per cent sodium hydroxide and 0.5 Gm. of fine aluminum wire in small pieces, and allow to stand for 3 hours protected from escape or access of ammonia, then decant 25 cc. and add to it 2 cc. of Nessler's reagent. The color produced is not greater than that produced by treating 0.04 mg. of ammonium chloride in the same manner as the potassium chlorate (0.001 per cent N).

Sulfate—Dissolve 2 Gm. in 50 cc. of distilled water, add 1 cc. of diluted hydrochloric acid and 2 cc. of barium chloride T.S. No turbidity or precipitate is formed in 30 minutes (about 0.01 per cent SO_4).

Heavy metals—To 2 Gm. add 5 cc. of distilled water and 5 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Repeat the evaporation with 2 cc. of hydrochloric acid. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 646. The heavy metals limit for potassium chlorate is 10 parts per million.

Sodium—A 10 per cent solution in hot distilled water tested on a platinum wire imparts no pronounced yellow color to a colorless flame (about 0.02 per cent Na).

Potassium Chloride, KCl —Colorless crystals or a white granular powder. It is odorless. Very soluble in water, slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 0.5 mg. (0.005 per cent), page 645.

Neutrality—Dissolve 5 Gm. in 50 cc. of carbon dioxide-free distilled water and add 3 drops of phenolphthalein T.S.: no pink color should be produced. Add 0.2 cc. of fiftieth-normal sodium hydroxide solution: a pink color should be produced.

Chlorate and nitrate—Dissolve 1 Gm. in 10 cc. of distilled water, add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color should not be entirely destroyed in 5 minutes (about 0.001 per cent as ClO_3 or 0.003 per cent as NO_3).

Nitrogen compounds—Determine as described under *Oxalic Acid*, page 694, using 2 Gm. of potassium chloride and 10 cc. of 10 per cent sodium hydroxide solution. The color produced is not greater than that produced in a control test with a quantity of ammonium salt corresponding to 0.01 mg. of nitrogen (0.001 per cent of N).

Phosphate—Dissolve 5 Gm. in 20 cc. of distilled water, add 10 cc. of nitric acid

and evaporate to dryness. Dissolve the residue in 5 cc. of distilled water, add 5 cc. of nitric acid, and re-evaporate to dryness. Dissolve the residue in 50 cc. of distilled water, add 10 cc. of nitric acid, nearly neutralize with ammonia T.S., and proceed as described under *Potassium Carbonate, Anhydrous*, page 701. If a yellow precipitate is formed, it is not greater than that produced from 0.10 mg. of phosphate (PO_4) treated with the same quantities of the same reagents as in the above test (0.002 per cent PO_4).

Sulfate—The sulfate in 2 Gm. corresponds to not more than 0.1 mg. of SO_4 (0.005 per cent), page 645.

Barium—Dissolve 4 Gm. in 20 cc. of distilled water, filter if necessary, and divide in 2 portions. To 1 portion add 2 cc. of diluted sulfuric acid and to the other add 2 cc. of distilled water; the solutions should be equally clear at the end of 2 hours (about 0.001 per cent Ba).

Calcium, magnesium, and ammonia precipitate—Dissolve 10 Gm. in 75 cc. of distilled water, add 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S. and 25 cc. of ammonia T.S. Allow to stand over night. Filter, wash with distilled water containing 2.5 per cent of ammonia, and dry. Mix the residue with 20 mg. of sucrose and ignite to constant weight: the weight does not exceed 0.5 mg. (0.005 per cent).

Heavy metals—The heavy metals limit for potassium chloride is 5 parts per million, using 3 Gm. for the test, page 646.

Iron—The iron in 3 Gm. corresponds to not more than 0.010 mg. of Fe (about 3 parts per million), page 646.

Sodium—Test a 10 per cent solution of the potassium chloride on a platinum wire in the flame: no pronounced yellow color should be produced (about 0.02 per cent of Na).

Potassium Chromate, K_2CrO_4 —Yellow crystals, very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. collected on an asbestos filter is not more than 1 mg. (0.01 per cent), page 645.

Free alkali—Dissolve 1 Gm. in 50 cc. of distilled water, cool to 15°C ., and add 2 drops of phenolphthalein T.S.: if a pink color is produced, it should be discharged by the addition of not more than 0.2 cc. of tenth-normal acid.

Chloride—Dissolve 1 Gm. in 20 cc. of distilled water, add 10 cc. of nitric acid, heat to about 50°C . and add a few drops of silver nitrate T.S.: no turbidity should develop within 5 minutes (about 0.005 per cent Cl).

Sulfate—Dissolve 1 Gm. in 20 cc. of distilled water, add 5 cc. of hydrochloric acid and 2 cc. of barium chloride T.S.: no precipitate is formed in 1 hour.

Calcium—Dissolve 5 Gm. in 50 cc. of distilled water, add a few drops of ammonia T.S. and 5 cc. of ammonium oxalate T.S., and allow to stand over night: if a precipitate is formed, it should not be greater than that formed in a slightly ammoniacal solution of equal volume containing 0.25 mg. of calcium and 5 cc. of ammonium oxalate T.S. (0.005 per cent).

Sodium—A 10 per cent solution tested with a platinum wire in the flame imparts no distinct yellow color to the flame (about 0.02 per cent of Na).

Potassium Citrate, $\text{C}_3\text{H}_4(\text{OH})(\text{COOK})_3\cdot\text{H}_2\text{O}$ —Use *Potassii Citras*, page 374.

Potassium Cyanide, KCN—White fragments or granules. Freely soluble in water, slightly soluble in alcohol. Gradually decomposes in aqueous solution.

Caution—On account of the extremely poisonous nature of this reagent itself and of the gas evolved from it on treatment with acids, all tests must be made in a hood, with a strong draft, and special care must be taken to avoid inhalation of the fumes. Pipettes must not be used in measuring its solutions.

Assay—Weigh accurately about 0.5 Gm. and dissolve it in a flask in 30 cc. of distilled water. Add 3 drops of potassium iodide T.S. and 3 cc. of ammonia T.S. and titrate with tenth-normal silver nitrate to a slight permanent turbidity. Each cc. of tenth-normal silver nitrate is equivalent to 0.01302 Gm. of KCN. Not less than 95 per cent of KCN should be found.

Solution A—Dissolve 10.0 Gm. in sufficient distilled water to make 200 cc., filter the solution if necessary and use it for the following tests:

Chloride—Transfer 20 cc. of Solution A, measured with a graduated cylinder, in a 100-cc. volumetric flask and dilute with 30 cc. of distilled water. Add 25 cc. of solution of formaldehyde, mix well, and allow to stand for 10 minutes; then add 5 cc. of nitric acid and exactly 5 cc. of tenth-normal silver nitrate. Dilute with distilled water to the 100-cc. mark and mix well. Filter through a dry filter into a dry flask, rejecting the first 10 cc. of the filtrate, then titrate the excess of silver nitrate in 50 cc. of the filtrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate as the indicator. It requires not less than 1.8 cc. of the thiocyanate (about 0.5 per cent Cl).

Ferrocyanide—Dilute 20 cc. of Solution A, measured with a graduated cylinder, with 20 cc. of distilled water, then add, under a hood, 3 cc. of hydrochloric acid and 1 drop of freshly prepared ferric chloride T.S. Any blue or green color produced in 15 minutes is not darker than that of a control made with 2 mg. of potassium ferrocyanide (about 0.1 per cent as $\text{Fe}(\text{CN})_6$).

Sulfate—Evaporate 10 cc. of Solution A, measured with a graduated cylinder, with 3 cc. of hydrochloric acid, to dryness on a steam bath under a hood with a good draft. Dissolve the residue in 20 cc. of distilled water, add 0.5 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. If turbidity is produced, it is not greater than that in a control made with 0.1 mg. of SO_4 (0.02 per cent).

Sulfide—To 20 cc. of Solution A, measured with a graduated cylinder, add 3 drops of a solution made by adding 10 per cent sodium hydroxide solution to 10 per cent lead acetate solution until the precipitate first formed redissolves. If a color is produced it is not darker than that produced by the same quantity of alkaline lead solution in 20 cc. of distilled water containing 0.23 mg. of sodium sulfide ($\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$).

Thiocyanate—To 20 cc. of Solution A, measured with a graduated cylinder, add under a hood 4 cc. of hydrochloric acid and 4 drops of ferric ammonium sulfate T.S. The color of the solution is not darker than that of a blank.

Heavy metals—Dilute 20 cc. of Solution A, measured with a graduated cylinder, with 10 cc. of distilled water, and add 10 cc. of hydrogen sulfide T.S.; no darkening of the solution occurs, nor does a dark color appear when 7 cc. of the diluted hydrochloric acid is added to the solution under a hood.

Sodium—Evaporate under a hood 2 cc. of Solution A, measured with a graduated cylinder, with 2 cc. hydrochloric acid, to dryness. The solution of the residue in 5

cc. of distilled water, tested on a platinum wire, imparts no pronounced yellow color to a colorless flame (about 0.1 per cent Na).

Potassium Dichromate, $K_2Cr_2O_7$ —Dark yellowish red crystals or crystalline granules. Soluble in water, insoluble in alcohol.

Insoluble and ammonium hydroxide precipitate—To a solution of 10 Gm. in 100 cc. of hot distilled water add 1 cc. of stronger ammonia T.S. and digest for 1 hour on a steam bath. Filter, wash thoroughly, ignite, and weigh. The weight of the ignited precipitate should not exceed 1.0 mg. (0.01 per cent).

Chloride—Dissolve 1 Gm. in 20 cc. of distilled water, add 10 cc. of nitric acid, heat to about $50^\circ C.$, and add a few drops of silver nitrate T.S.: no turbidity should develop within 5 minutes (about 0.005 per cent Cl).

Sulfate—Dissolve 10 Gm. in 250 cc. of distilled water and 4 cc. of hydrochloric acid. Heat the solution to boiling and add 25 cc. of a solution containing 1 Gm. of barium chloride and 2 cc. of hydrochloric acid in each 100 cc. of solution. Digest on a water bath for 2 hours and allow to stand at room temperature over night. If any precipitate forms, filter, wash, ignite, and weigh. The weight of the residue after correcting for a complete blank should not exceed 1.2 mg. If the residue exceeds 1.2 mg., fuse it with 1 Gm. of sodium carbonate. Extract the fused mass with distilled water and filter off the insoluble residue. Add 5 cc. of hydrochloric acid to the filtrate, dilute to about 200 cc., heat to boiling, and add 10 cc. of alcohol. Digest on a water bath until the reduction of the chromate is complete, as indicated by the change to a clear green or colorless solution. Neutralize the solution with ammonia T.S., add 2 cc. of hydrochloric acid, heat to boiling, and add 10 cc. of barium chloride T.S. Digest on a water bath for 2 hours and allow to stand over night. If a precipitate is present, filter, wash, and ignite. The weight of the precipitate, after correcting for a complete blank, is not more than 1.2 mg. (about 0.005 per cent of SO_4).

Calcium—Dissolve 5 Gm. in 50 cc. of hot distilled water; add a slight excess of ammonia T.S. and 5 cc. of ammonium oxalate T.S.: any precipitate formed on standing over night should not be greater than that formed in a slightly ammoniacal solution of equal volume, containing 0.25 mg. of Ca and 5 cc. of ammonium oxalate T.S. (0.005 per cent Ca).

Sodium—A 10 per cent solution, tested with a platinum wire in the flame, imparts no distinct yellow color to the flame (about 0.02 per cent Na).

Potassium Ferricyanide, $K_3Fe(CN)_6$ —Dark red crystals. Very soluble in water.

Insoluble—The insoluble matter from 10 Gm., dissolved in 50 cc. of cold distilled water without heating, is not more than 1.0 mg. (0.01 per cent), page 645.

Chloride—Dissolve 2 Gm. in 175 cc. of distilled water, add 2.5 Gm. of cupric sulfate crystals (free from chloride) dissolved in 25 cc. of distilled water, mix thoroughly, and allow to stand for 15 minutes. To 50 cc. of the clear, supernatant solution, add 2 cc. of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity is not greater than that produced in a blank by 0.05 mg. of Cl (0.01 per cent of Cl), page 645.

Sulfate—Dissolve 5 Gm. in 100 cc. of distilled water without heating, filter, and to the filtrate add 5 drops of glacial acetic acid and 5 cc. of barium chloride T.S.: no turbidity is produced in 10 minutes (about 0.01 per cent of SO_4).

Ferro compounds—Dissolve 4 Gm. in 400 cc. of distilled water, add 10 cc. of 20 per cent sulfuric acid, and immediately follow with 0.1 cc. of tenth-normal potassium permanganate. The solution, after stirring, should retain a pink tint in com-

parison with a control test made with the same quantities of the same ferricyanide, water and acid [0.05 per cent of $\text{Fe}(\text{CN})_6$].

Potassium Ferrocyanide, $\text{K}_4\text{Fe}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$ —Yellow, transparent crystals. Very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter, from 10 Gm. dissolved in cold distilled water without heating, is not more than 1.0 mg. (0.01 per cent), page 645.

Chloride—Determine as described under *Potassium Ferricyanide*: the turbidity corresponds to not more than 0.05 mg. of Cl (0.01 per cent).

Sulfate—It complies with the test as described under *Potassium Ferricyanide*.

Potassium Hydroxide, KOH—Use *Potassii Hydroxidum*, page 376.

Potassium Iodate, KIO_3 —White, crystalline powder, soluble in water.

Insoluble—The insoluble matter from 10 Gm., dissolved in 150 cc. of hot distilled water, is not more than 0.5 mg. (0.005 per cent), page 645.

Neutrality—Dissolve 3 Gm. in 40 cc. of warm distilled water and add 3 drops of phenolphthalein T.S.: no pink color should be produced. Add 0.2 cc. of fiftieth-normal sodium hydroxide: a pink color should be produced.

Chloride and bromide—Mix 1 Gm. of the powdered Potassium Iodate with 2 Gm. of sucrose and ignite carefully at a low temperature, taking small portions at a time. Treat the residue with 10 cc. of hot distilled water, and 1 cc. of dilute nitric acid (1 in 5), filter and wash with 10 cc. of hot distilled water. Cool and add 15 cc. of ammonia T.S. Add 20 cc. of 5 per cent silver nitrate solution with constant stirring, dilute to 50 cc., and filter. To 25 cc. of the filtrate add a slight excess of nitric acid. The turbidity is not greater than that produced by 0.10 mg. of chloride ion in an equal volume of solution containing the same quantities of the same reagents (about 0.02 per cent as Cl).

Chlorate—To 2 Gm. of the powdered Potassium Iodate add 2 cc. of reagent sulfuric acid: the salt should remain white and no odor or gas should be evolved (about 0.01 per cent ClO_3).

Iodide—Dissolve 1 Gm. in 20 cc. of distilled water, add 1 cc. of chloroform and 0.5 cc. of normal sulfuric acid: no violet color should be produced in the chloroform in one minute (about 0.01 per cent I).

Nitrogen compounds—Dissolve 1 Gm. in 30 cc. of distilled water, add 10 cc. of 10 per cent sodium hydroxide solution and 0.5 Gm. of aluminum wire or foil in small pieces. Allow to stand 3 hours protected from loss or access of ammonia. Dilute to 75 cc., distil off 50 cc., and to the distillate add 2 cc. of Nessler's reagent. The color should not be greater than that produced in a similar volume of a solution obtained by treating a quantity of an ammonium salt corresponding to 0.05 mg. of nitrogen with the same quantities of distilled water and reagents used in the test (0.005 per cent of N).

Sulfate—Evaporate 2 Gm. to dryness with 10 cc. of hydrochloric acid and repeat the evaporation twice with 5 cc. of the acid: the residue dissolved in 25 cc. of distilled water shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 645.

Heavy metals—To 2 Gm. add 5 cc. of distilled water and 10 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Repeat the evaporation twice with 5 cc. of hydrochloric acid. Test the residue for heavy metals as described in the test

for *heavy metals in reagents*, page 646. The heavy metals limit for potassium iodate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 646.

Sodium—Test a warm 10 per cent aqueous solution in the flame with a platinum wire: no pronounced yellow color is produced (about 0.03 per cent Na).

Potassium Iodide, KI—Use *Potassii Iodidum*, page 377.

Potassium Nitrate, KNO_3 —Colorless, transparent crystals or a white crystalline powder. It is odorless.

Insoluble—The insoluble matter from 10 Gm. is not more than 0.5 mg. (0.005 per cent), page 645.

Neutrality—Dissolve 5 Gm. in 50 cc. of distilled water free from carbon dioxide, and add 3 drops of phenolphthalein T.S.: no pink color should be produced, but on the addition of 0.2 cc. of fiftieth-normal sodium hydroxide a pink color should be produced.

Chlorine (total)—Ignite 2 Gm. at first gently, then for a few minutes at a low red heat, and cool: the residue dissolved in 25 cc. of distilled water shows no more chloride than corresponds to 0.02 mg. of Cl (0.001 per cent), page 645.

Iodate and nitrite—Dissolve 1 Gm. in 10 cc. of distilled water, add 2 drops of potassium iodide T.S., 1 cc. of chloroform, and 2 cc. of acetic acid. Shake the mixture gently for a few minutes. The chloroform should not acquire a pink or violet color (about 0.0005 per cent IO_3 , and about 0.001 per cent NO_2).

Phosphate—Dissolve 5 Gm. in 50 cc. of distilled water, add 10 cc. of nitric acid, nearly neutralize with ammonia T.S., and proceed with the test as described under *Ammonium Nitrate*, page 653. If a yellow precipitate is formed, it is not greater than that produced in a control test with 0.025 mg. of PO_4 (0.0005 per cent).

Sulfate—Dissolve 2 Gm. in 5 cc. of distilled water, add 5 cc. of hydrochloric acid, evaporate to dryness, and re-evaporate to dryness with another 5 cc. of hydrochloric acid: the residue dissolved in 25 cc. of distilled water shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 645.

Calcium, magnesium, and ammonia precipitate—Determine as described under *Potassium Chloride*, page 703: the weight does not exceed 1.0 mg. (0.01 per cent).

Heavy metals—The heavy metals limit for potassium nitrate is 5 parts per million, using 2 Gm. for the test, page 646.

Iron—The iron in 2 Gm. corresponds to not more than 0.006 mg. of Fe (3 parts per million), page 646.

Sodium—A 10 per cent aqueous solution, tested with a platinum wire, imparts no distinct yellow color to a flame (about 0.02 per cent Na).

Potassium Nitrite, KNO_2 —White, or nearly white, deliquescent sticks or granules. Soluble in water, insoluble in alcohol.

Assay—Weigh accurately about 1 Gm. and dissolve it in sufficient distilled water to measure exactly 100 cc. Add 10 cc. of this solution from a pipette to a mixture of 40 cc. of tenth-normal potassium permanganate, 100 cc. of distilled water and 5 cc. of sulfuric acid. In adding the potassium nitrite solution, immerse the tip of the pipette beneath the surface of the permanganate mixture. Allow to stand for 5 minutes, add 25 cc. of tenth-normal oxalic acid, and titrate with tenth-normal po-

tassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.004255 Gm. of KNO_3 . It shows not less than 85 per cent of KNO_3 .

Chloride—The chloride in 0.5 Gm. corresponds to not more than 0.1 mg. of Cl (0.02 per cent), page 645.

Sulfate—Dissolve 1 Gm. in 5 cc. of distilled water, add 3 cc. of hydrochloric acid, evaporate to dryness on a water bath, and dissolve the residue in 100 cc. of distilled water; 10 cc. of the solution, diluted to 25 cc. with distilled water, shows no more sulfate than corresponds to 0.025 mg. of SO_4 (0.25 per cent), page 645.

Heavy metals—Dissolve 1 Gm. in 5 cc. of distilled water and evaporate to dryness with 3 cc. of reagent hydrochloric acid. Dissolve the residue in 10 cc. of distilled water and 1 cc. of normal hydrochloric acid and add 10 cc. of hydrogen sulfide T.S. Any darkening produced is not greater than that produced by 0.02 mg. of lead in an equal volume of solution containing the same quantities of the same reagents used in the test (20 parts per million).

Sodium—A 5 per cent aqueous solution tested with a platinum wire imparts no pronounced yellow color to the flame (about 0.02 per cent Na).

Potassium Oxalate, $\text{K}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ —Colorless or white crystals; efflorescent in dry air. Freely soluble in water; slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Neutrality—Dissolve 2 Gm. in 150 cc. of carbon dioxide-free distilled water. Add 0.2 cc. of phenolphthalein T.S. and boil for 10 minutes while passing through the solution a current of carbon dioxide-free air. Prepare a color standard as follows: Dilute 10 cc. of tenth-normal sodium hydroxide to 100 cc. with carbon dioxide-free distilled water and add 0.2 cc. of phenolphthalein T.S., then dilute 6 cc. of the red liquid to 150 cc. with carbon dioxide-free distilled water. Titrate the hot potassium oxalate solution with hundredth-normal sodium hydroxide or with hundredth-normal hydrochloric acid until the color matches that of the standard. It requires not more than 0.8 cc. of hundredth-normal sodium hydroxide, nor more than 1.4 cc. of hundredth-normal hydrochloric acid.

Chloride—Ignite 2 Gm. and dissolve the residue in 20 cc. of distilled water. Neutralize the solution with nitric acid and add 0.5 cc. excess of the acid. Filter and add to the filtrate 1 cc. of silver nitrate T.S.: any turbidity produced is not greater than that produced in a blank to which 0.04 mg. of Cl has been added (0.002 per cent).

Nitrogen compounds—Dissolve 1 Gm. in 50 cc. of distilled water, add 10 cc. of 10 per cent sodium hydroxide solution and 0.5 Gm. of fine aluminum wire in small pieces, and allow to stand 3 hours protected from loss or access of ammonia. Decant 30 cc. and add to it 1 cc. of Nessler's reagent. Any yellow color produced is not darker than a control made by treating 0.04 mg. of nitrogen (as NH_4Cl) in the same manner as the potassium oxalate (0.008 per cent).

Sulfate—Ignite 2 Gm. in platinum protected from sulfur in the flame. Boil the residue with 20 cc. of distilled water and 2 cc. of bromine T.S., then add 3 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 20 cc. of distilled water and 1 cc. of normal hydrochloric acid, filter, and add to the filtrate 2 cc. of barium chloride T.S. Any resulting turbidity is not greater than that in a control made as follows: evaporate 2 cc. of bromine T.S. and 3 cc. of hydro-

chloric acid to dryness on a steam bath, dissolve the residue and 0.2 mg. of SO_4 in sufficient distilled water to make 20 cc., then add 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. (0.01 per cent).

Heavy metals—Ignite 4 Gm. gently in porcelain. Add to the residue 5 cc. of distilled water, 5 cc. of hydrochloric acid, and 2 cc. of nitric acid, and evaporate to dryness on a water bath. Dissolve the residue in 40 cc. of distilled water and filter. To 10 cc. of the filtrate add 0.4 cc. of standard lead solution, page 586, dilute with distilled water to 30 cc., and add 1 cc. of normal acetic acid (A). To the remaining 30 cc. of the filtrate add 1 cc. of normal acetic acid (B). Then to each add 10 cc. of hydrogen sulfide T.S.: B is no darker than A (20 parts per million).

Sodium—Ignite 1 Gm. in platinum and dissolve the residue in 10 cc. of 10 per cent hydrochloric acid. The solution, tested on a platinum wire, imparts no distinct yellow color to a colorless flame (about 0.02 per cent Na).

Substances darkened by sulfuric acid—In a recently ignited test tube heat 1 Gm. with 10 cc. of reagent sulfuric acid until fumes of SO_3 are evolved: not more than a slight brownish tinge is produced.

Potassium Perchlorate, KClO_4 —Colorless or white crystals. Soluble in 65 parts of cold water, in 15 parts of boiling water; insoluble in alcohol.

Chloride—Dissolve 1 Gm. in 20 cc. of hot distilled water, add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any resulting turbidity is not greater than that produced in a blank to which 0.03 mg. of Cl has been added (0.003 per cent).

Chloride and chlorate—Dissolve 1 Gm. in 30 cc. of hot distilled water and add 1 cc. of a fresh 10 per cent ferrous sulfate solution. Allow to stand for 3 minutes, then add 3 cc. of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity produced is not greater than that produced in a blank to which 0.1 mg. of Cl has been added (0.01 per cent).

Nitrogen compounds—Dissolve 1 Gm. in 75 cc. of distilled water, add 15 cc. of 10 per cent sodium hydroxide solution and 1 Gm. of powdered Devarda's alloy. Allow to stand 2 hours protected from loss or access of ammonia, then distil 50 cc. into 5 cc. of tenth-normal hydrochloric acid, and add to the distillate 1 cc. of 10 per cent sodium hydroxide solution and 2 cc. of Nessler's reagent: the color produced is not darker than that produced by treating 0.02 mg. of nitrogen (as NH_4Cl) in the same manner as the potassium perchlorate (0.002 per cent).

Sulfate—Dissolve 8 Gm. in 200 cc. of hot distilled water and add 1 cc. of hydrochloric acid. Heat to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. Warm to dissolve any potassium perchlorate that may crystallize, filter, wash with hot distilled water, and ignite: the weight of the barium sulfate is not more than 1.0 mg. (0.005 per cent as SO_4).

Calcium—Dissolve 1 Gm. in 20 cc. of hot distilled water, add 5 drops of ammonia T.S. and 3 cc. of ammonium oxalate T.S.: no turbidity is produced in 5 minutes.

Heavy metals—Dissolve 0.5 Gm. in 20 cc. of hot distilled water, add 1 cc. of normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no darkening is produced (about 20 parts per million).

Sodium—A 5 per cent solution in hot distilled water, tested on a platinum wire, imparts no distinct yellow color to a colorless flame (about 0.02 per cent Na).

Potassium Permanganate, KMnO_4 —Use *Potassii Permanganas*, page 379.

Potassium Phosphate, Dibasic (*Dipotassium Phosphate*), K_2HPO_4 —White, somewhat hygroscopic granules or powder. Very soluble in water, slightly soluble in alcohol.

Insoluble—Dissolve 10 Gm. in 100 cc. of distilled water and heat the solution on a water bath for 30 minutes. Filter any undissolved residue, wash it well with hot distilled water, and dry at $105^\circ C$. Its weight does not exceed 2.0 mg. (0.02 per cent).

Monobasic or tribasic salt—Dissolve 2 Gm. in 50 cc. of distilled water in a flask and boil the solution for 5 minutes. Then cool to about $25^\circ C$., and add 3 drops phenolphthalein T.S. A red color is produced which is discharged by the addition of 1 cc. of normal hydrochloric acid.

Chloride—The chloride from 1 Gm. corresponds to not more than 0.10 mg. of Cl (0.01 per cent).

Nitrate—Dissolve 2 Gm. in 10 cc. of distilled water, add 1 drop of diluted hydrochloric acid and 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid. The blue color persists for 5 minutes (about 0.005 per cent NO_3).

Sulfate—Dissolve 5 Gm. in 100 cc. of distilled water and 5 cc. of hydrochloric acid and filter. Boil the filtrate, add 5 cc. of barium chloride T.S., and allow to stand over night. Filter any precipitate if present, wash it with hot distilled water, and ignite. The weight of the precipitate does not exceed 10.0 mg. (0.08 per cent SO_4).

Ammonia—Dissolve 0.5 Gm. in 20 cc. of distilled water, add 5 cc. of sodium hydroxide T.S. and 1 cc. of Nessler's reagent. The resulting color is not darker than that of a control made with 0.05 mg. of NH_3 (0.01 per cent).

Arsenic—Test 0.2 Gm. for arsenic as described on page 554. The stain produced corresponds to not more than 0.002 mg. of As (10 parts per million).

Heavy metals—Dissolve 1 Gm. in 30 cc. of distilled water, add 2 drops of phenolphthalein T.S., and add normal sulfuric acid until the red color just disappears. Add 5 cc. more of normal sulfuric acid, then add 5 cc. of hydrogen sulfide T.S. No dark color is produced (20 parts per million).

Potassium Sulfate, K_2SO_4 —Hard, colorless crystals, or white granules, or powder. Soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm., using 150 cc. of hot distilled water is not more than 1.0 mg. (0.01 per cent), page 645.

Neutrality—To a solution of 5 Gm. in 50 cc. of carbon dioxide-free hot distilled water add 3 drops of phenolphthalein T.S.: no pink color should be produced (*alkali*) and on the addition of 1 drop of tenth-normal sodium hydroxide a pink color should be produced.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.01 mg. of Cl (0.001 per cent), page 645.

Nitrogen compounds—Dissolve 3 Gm. in 35 cc. of warm distilled water in a flask, cool, add 10 cc. of 10 per cent sodium hydroxide solution and about 0.5 Gm. of aluminum wire in small pieces, and allow to stand for 3 hours, the flask being suitably protected to prevent access or escape of ammonia. Decant 30 cc. and add 1 cc. of Nessler's reagent: the yellow color is not greater than that produced by the same treatment of a quantity of ammonium chloride corresponding to 0.01 mg. of nitrogen (0.0005 per cent of N).

Arsenic—Test 1 Gm. as described on page 554. The stain produced corresponds to not more than 0.002 mg. of As (2 parts per million).

Calcium, magnesium, and ammonia precipitate—Proceed as described under *Potassium Chloride*, page 703, using 5 Gm. of the potassium sulfate: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Heavy metals—The heavy metals limit for potassium sulfate is 5 parts per million, using 2 Gm. for the test, page 646.

Iron—The iron in 2 Gm. corresponds to not more than 0.01 mg. of Fe (5 parts per million), page 646.

Sodium—A 10 per cent solution tested with a platinum wire imparts no distinct yellow color to the flame (about 0.02 per cent Na).

n-Propyl Alcohol (*n-Propanol*), $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ —Clear colorless liquid; alcohol-like odor. Miscible with water and the usual organic solvents. Specific gravity about 0.803 at 25° C.

Boiling range—Not less than 95 per cent distills between 95° and 98° C.

Non-volatile—Evaporate 10 cc. of *n*-propyl alcohol on a steam bath and dry the residue for 1 hour at 110° C. The weight of the residue does not exceed 1.0 mg.

Acidity—To 20 cc. of distilled water add 0.2 cc. of phenolphthalein T.S., then add tenth-normal sodium hydroxide, dropwise, until a slight pink color persists after shaking. Disregard the volume of sodium hydroxide required. Now add 10 cc. of the alcohol, mix, and titrate with tenth-normal sodium hydroxide until the pink color is reproduced; not more than 0.2 cc. of the sodium hydroxide is required.

Pyridine, $\text{C}_5\text{H}_5\text{N}$ —Colorless, clear liquid, having a characteristic, disagreeable odor; hygroscopic. Miscible with water, alcohol, chloroform, and many other organic liquids. Specific gravity about 0.98 at 25° C. Keep in a tight container.

Boiling range—Not less than 90 per cent distills between 113° and 116° C.

Non-volatile matter—Evaporate 10 cc. on a steam bath and dry the residue for 1 hour at 105° C. The weight of the residue does not exceed 1 mg.

Chloride—The chloride from 2 cc. of Pyridine corresponds to not more than 0.002 mg. of Cl (0.001 per cent).

Sulfate—The sulfate from 2 cc. corresponds to not more than 0.1 mg. of SO_4 (0.005 per cent).

Ammonia—Mix 2 cc. with 10 cc. of boiled and cooled distilled water and add 2 drops of phenolphthalein T.S. If a pink color is produced, it is discharged by 0.2 cc. of fiftieth-normal hydrochloric acid.

Copper—Mix 5 cc. with 15 cc. of distilled water, add 2 cc. of glacial acetic acid, 5 cc. of 5 per cent ammonium thiocyanate solution, and 5 cc. of chloroform, shake vigorously, and allow to separate. The chloroform layer is not green and, at most, only slightly yellow.

Substances insoluble in water—Mix 5 cc. of Pyridine with 45 cc. of distilled water: a clear solution results.

Substances reducing permanganate—To 5 cc. add 0.5 cc. of tenth-normal potassium permanganate. The pink color does not entirely disappear in 15 minutes.

Pyrogallol, $\text{C}_6\text{H}_3(\text{OH})_3$ —White, lustrous crystals. Very soluble in water or alcohol. **Melting point**—Between 131° and 133° C. **Solubility**—A freshly prepared solution of pyrogallol (1 in 20) in recently boiled distilled water is colorless or, at most, only slightly yellow. **Ash (sulfated)**—Not more than 0.1 per cent.

Red Mercuric Iodide—See *Mercuric Iodide, Red*.

Resorcinol, $C_6H_4(OH)_2$ —Use *Resorcinol*, page 391.

Salicylic Acid, $C_6H_4(OH)COOH$ —Use *Acidum Salicylicum*, page 28.

Sand, Washed—It may be prepared in the following manner: digest clean, hard sand at room temperature with a mixture of 1 part of hydrochloric acid and 2 parts of distilled water (about 13 per cent of HCl) for several days, or at an elevated temperature for several hours. Collect the sand on a filter, wash with distilled water until the washings are neutral and show only a slight reaction for chloride, and finally dry. Washed Sand meets the following tests:

Substances soluble in hydrochloric acid—Digest 10 Gm. of Washed Sand with a mixture of 10 cc. of hydrochloric acid and 40 cc. of distilled water on a steam bath for 4 hours, replacing from time to time the water lost by evaporation. Filter, and to 25 cc. of the filtrate add 5 drops of sulfuric acid, evaporate and ignite to constant weight: the weight of the residue does not exceed 8.0 mg.

Chloride—Shake 1 Gm. with 20 cc. of distilled water for 2 minutes, filter, and add to the filtrate 1 cc. of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity produced corresponds to not more than 0.05 mg. of Cl (0.005 per cent).

Sawdust, Purified—It may be prepared as follows: extract sawdust in a percolator, first with a 1 per cent solution of sodium hydroxide, then with a 1 per cent solution of hydrochloric acid until the acid percolate gives no test for alkaloid with mercuric potassium iodide T.S. or with iodine T.S. Then wash with distilled water until free from acid and soluble salts, and dry. Purified Sawdust meets the following tests:

Alkaloids—To 5 Gm. of Purified Sawdust contained in a flask, add 50 cc. of ether-chloroform mixture and 10 cc. of ammonia T.S. and shake frequently during 2 hours. Decant 20 cc. of the clear, ethereal liquid, and evaporate to dryness. Dissolve the residue in 2 cc. of normal hydrochloric acid and divide into 2 portions. To 1 portion add mercuric potassium iodide T.S. and to the other add iodine T.S.: no turbidity is produced in either portion.

Selenous Acid, H_2SeO_3 —Colorless crystals. Efflorescent in dry air and hygroscopic in moist air. Soluble in water and in alcohol.

Silver Nitrate, $AgNO_3$ —Reagent Silver Nitrate conforms to the requirements given under *Agenii Nitras*, and also meets the following test:

Substances not precipitated by hydrochloric acid—Dissolve 10 Gm. in 200 cc. of distilled water, heat to boiling, and add hydrochloric acid to completely precipitate the silver. Allow to stand over night, then filter, and wash with about 50 cc. of distilled water, containing 1 cc. of nitric acid. Evaporate the filtrate and washings to dryness, add to the residue 3 drops of hydrochloric acid and 10 cc. of distilled water, heat to boiling, and filter. Evaporate the resulting filtrate to dryness and dry the residue for 3 hours at $110^\circ C$. Run a blank test and deduct the weight of the blank from that obtained in the test with the silver nitrate. The quantity of the corrected residue is not more than 1.0 mg.

Silver Sulfate, Ag_2SO_4 —Small, white, lustrous crystals or a white powder. Slightly soluble in water. Dissolved by nitric acid and by ammonia T.S.

Insoluble and chloride—Add 5 Gm. of the powdered salt to 500 cc. of boiling distilled water and boil gently until the silver sulfate is dissolved. If any insoluble residue remains, filter while hot through asbestos in a Gooch crucible and wash with hot distilled water until the washings show no reaction with hydrogen sulfide. Dry at from 105° to 110° C.: the weight of the residue should not exceed 1.0 mg. (0.02 per cent).

Nitrate—To 0.5 Gm. of the powdered salt add 2 cc. of phenoldisulfonic acid T.S., heat on a water bath for 15 minutes, cool, dilute with 10 cc. of distilled water and render alkaline with ammonia T.S. Any yellow color is not greater than that produced when a quantity of potassium nitrate equivalent to 0.005 mg. of NO_3 is evaporated to dryness and treated with the same quantities of the same reagents (0.001 per cent of NO_3).

Substances not precipitated by hydrochloric acid—Heat to boiling the filtrate obtained in the test for *insoluble and chloride*, add 5 cc. of reagent hydrochloric acid, and allow to stand over night. Add distilled water to measure 500 cc. and filter. Evaporate 300 cc. of the filtrate to dryness, add 3 drops of hydrochloric acid and 10 cc. of distilled water, heat, and filter. Evaporate the filtrate to dryness, dry at 110° C. for 3 hours, and weigh. Run a blank and deduct the weight obtained in the blank from that obtained in the original test: the corrected weight of the residue should not exceed 1.0 mg. (about 0.03 per cent).

Iron—Dissolve the residue obtained in the test for substances not precipitated by hydrochloric acid by warming it with a few drops of hydrochloric acid. Dilute to 25 cc., add 3 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color produced should correspond to not more than 0.06 mg. of Fe (20 parts per million).

Keep Silver Sulfate in light-resistant containers.

Sodium Acetate, $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$ —Colorless or white, crystals or granules, or fused lumps. Very soluble in water; sparingly soluble in alcohol.

Insoluble, calcium and magnesium—Dissolve 10 Gm. in 50 cc. of distilled water, add 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S., and 15 cc. of stronger ammonia water, and allow to stand over night. If any precipitate is formed, filter, wash it well with distilled water containing 2.5 per cent of NH_3 , ignite, and weigh. The weight of the ignited precipitate does not exceed 1 mg. (0.01 per cent).

Neutrality—Dissolve 5 Gm. in 100 cc. of carbon dioxide-free water, cool to 10° C., and add 5 drops of phenolphthalein T.S. If a pink color is produced, it is discharged by not more than 0.5 cc. of fiftieth-normal sulfuric acid. If no pink color is produced, the addition of 0.5 cc. of fiftieth-normal sodium hydroxide produces a pink color.

Chloride—A 2-Gm. portion shows no more chloride than corresponds to 0.02 mg. of Cl (0.001 per cent).

Phosphate—Dissolve 5 Gm. in 50 cc. of distilled water, add 10 cc. of nitric acid, and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake at about 40° C. for 5 minutes, and allow to stand for 30 minutes. If a yellow precipitate is formed, it is not greater than that produced when a quantity of potassium biphosphate, equivalent to 0.025 mg. of PO_4 , is treated in the same manner (0.0005 per cent).

Sulfate—A 2-Gm. portion shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent).

Heavy metals—The heavy metals limit for Sodium Acetate is 10 parts per million using 2 Gm. for the test and acidulating the solution with 2 cc. of normal hydrochloric acid, page 646.

Iron—The iron in 2 Gm. corresponds to not more than 0.01 mg. of Fe (5 parts per million).

Substances reducing permanganate—Dissolve 5 Gm. in 50 cc. of distilled water, add 5 cc. of diluted sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate. The pink color does not entirely disappear in 1 hour.

Sodium Acetate, Anhydrous (Fused Sodium Acetate), $\text{NaC}_2\text{H}_3\text{O}_2$ —Grayish white masses or powder. Hygroscopic and freely soluble in water.

Loss on drying—Dry about 1 Gm., accurately weighed, to constant weight at $120^\circ\text{C}.$: the loss in weight corresponds to not more than 3.0 per cent.

Neutrality—Dissolve 5 Gm. in 100 cc. of distilled water (carbon dioxide free). Cool to $10^\circ\text{C}.$ and add three drops of phenolphthalein T.S. If a pink color is produced, it should be discharged by the addition of 0.1 cc. of tenth-normal hydrochloric acid. If no pink color is produced, the addition of 0.1 cc. of tenth-normal sodium hydroxide should produce a pink color (about 0.02 per cent alkali as Na_2CO_3 and about 0.012 per cent acid as CH_3COOH).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.15 mg. of Cl (0.015 per cent), page 645.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 645.

Heavy metals—The heavy metals limit for Anhydrous Sodium Acetate is 15 parts per million, using 2 Gm. for the test and acidulating the solution with 2 cc. of normal hydrochloric acid, page 646.

Keep Anhydrous Sodium Acetate in tight containers.

Sodium Alizarinsulfonate (*Alizarin Red S*), $\text{C}_{14}\text{H}_5\text{O}_2(\text{OH})_2\text{SO}_3\text{Na}\cdot\text{H}_2\text{O}$ —A yellow brown or orange yellow powder. Freely soluble in water producing a yellow color; sparingly soluble in alcohol.

Sensitiveness—Add 3 drops of a 1 per cent aqueous solution of sodium alizarinsulfonate to 100 cc. of distilled water and follow with 0.05 cc. of tenth-normal sodium hydroxide; a red color is produced. Upon the subsequent addition of 0.05 cc. of tenth-normal hydrochloric acid the original yellow color returns.

Sodium Ammonium Phosphate (*Microcosmic Salt*), $\text{NaNH}_4\text{HPO}_4\cdot 4\text{H}_2\text{O}$ —Colorless crystals or white granules. Freely soluble in water; insoluble in alcohol. It effloresces in the air and loses ammonia.

Insoluble, and ammonium hydroxide precipitate—Dissolve 10 Gm. in 100 cc. of distilled water, add 10 cc. of ammonia T.S. and heat on a steam bath for 1 hour. If any precipitate is formed, filter, wash well with distilled water, and ignite. The weight of the ignited precipitate is not more than 1 mg. (0.01 per cent).

Chloride—The chloride from 1 Gm. corresponds to not more than 0.02 mg. of Cl (0.002 per cent Cl).

Nitrate—Dissolve 1 Gm. in 10 cc. of distilled water, add 0.1 cc. of indigo carmine

T.S., then add with stirring 10 cc. of sulfuric acid. The blue color persists for 10 minutes (about 0.005 per cent NO_3).

Sulfate—Dissolve 10 Gm. in 100 cc. of distilled water, add 5 cc. of hydrochloric acid, and filter if necessary. Heat the filtrate to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is present, filter, wash it well with hot distilled water, and ignite. The weight of the precipitate of barium sulfate does not exceed 5 mg. (0.02 per cent SO_4).

Heavy metals—Dissolve 3 Gm. in 25 cc. of distilled water, add 15 cc. of normal sulfuric acid, then add 10 cc. of hydrogen sulfide T.S. Any color developed in 1 minute is not darker than a control made with 3 cc. of standard lead solution and 0.5 cc. of normal sulfuric acid (10 parts per million).

Assay for ammonia—Weigh accurately about 0.5 Gm. and dissolve in 150 cc. of distilled water in a Kjeldahl flask, connected with a distillation trap to a condenser, the tip of which dips under the surface of 40 cc. of tenth-normal sulfuric acid. Add to the flask 25 cc. of 10 per cent sodium hydroxide solution and distil until about 125 cc. of distillate has collected in the receiver, then titrate the excess acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal acid is equivalent to 0.001703 Gm. of NH_3 . Not less than 7.7 per cent of NH_3 should be found.

Sodium Bicarbonate, NaHCO_3 —Use *Sodii Bicarbonas*, page 408.

Sodium Bisulfite (*Sodium Acid Sulfite*), NaHSO_3 —White crystals or a white granular powder, having an odor of sulfur dioxide. Freely soluble in water, slightly soluble in alcohol.

Assay—Use the method of assay as outlined under *Sodium Sulfite, Ersiccated*, page 723. Each cc. of tenth-normal iodine corresponds to 0.005204 Gm. of NaHSO_3 . It should contain not less than 90 per cent of NaHSO_3 .

Arsenic—Add 1 cc. of nitric acid to 0.2 Gm. and evaporate to dryness: the residue meets the requirements of the arsenic test, page 554.

Heavy metals—Dissolve 2 Gm. in 10 cc. of distilled water, add 5 cc. of reagent hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 1 cc. of tenth-normal hydrochloric acid and 20 cc. of distilled water, and add 10 cc. of hydrogen sulfide T.S. Any darkening produced is not greater than that produced by 0.02 mg. of Pb in an equal volume of solution containing the same quantities of the same reagents used in the test (10 parts per million).

Iron—Evaporate 1 Gm. with 2 cc. of hydrochloric acid to dryness on a water bath, treat the residue with 2 cc. of hydrochloric acid and 20 cc. of distilled water, and add a few drops of bromine T.S. Boil off the bromine, cool, dilute with distilled water to 20 cc., and add 3 cc. of ammonium thiocyanate T.S. Any red color produced is not greater than that produced in a control test made with 0.05 mg. of Fe (50 parts per million).

Keep Sodium Bisulfite in well-filled, tight containers in a cool place.

Sodium Bitartrate, $\text{NaHC}_4\text{H}_4\text{O}_6 \cdot \text{H}_2\text{O}$ —White crystals or a crystalline powder. Soluble in cold water.

Assay—Weigh accurately about 0.5 Gm. of sodium bitartrate, dissolve in 30 cc. of distilled water, and titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is

equivalent to 0.01901 Gm. of $\text{NaHC}_4\text{H}_4\text{O}_6 \cdot \text{H}_2\text{O}$. It contains not less than 99 per cent of $\text{NaHC}_4\text{H}_4\text{O}_6 \cdot \text{H}_2\text{O}$.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.2 mg. of Cl (0.02 per cent) page 645.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 645.

Heavy metals—Dissolve 2 Gm. in about 15 cc. of distilled water, add to the solution 2 drops of phenolphthalein T.S., and follow with ammonia T.S. until the solution is slightly pink. Then add 2 cc. of normal hydrochloric acid and dilute to 30 cc.: the heavy metals limit for Sodium Bitartrate is 10 parts per million.

Sodium Borate, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ —Use *Sodii Boras*, page 410.

Sodium Bromide, NaBr —Use *Sodii Bromidum*, page 411.

Sodium Carbonate, Anhydrous, Na_2CO_3 —A white, hygroscopic powder. It is soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Loss on ignition—Ignite 1 Gm. at a temperature not over 350°C .: the loss in weight should not exceed 10.0 mg. (1.00 per cent).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.05 mg. of Cl (0.005 per cent), page 645.

Nitrogen compounds—Determine as described under *Oxalic Acid*, page 694, using 10 cc. of 10 per cent sodium hydroxide solution. The color produced is not greater than that produced in a control test with a quantity of ammonium salt corresponding to 0.01 mg. of nitrogen (0.001 per cent of N).

Phosphate—Determine as described under *Anhydrous Potassium Carbonate*, page 701: the precipitate or turbidity corresponds to not more than that produced by 0.1 mg. of PO_4 (0.002 per cent).

Sulfate—Dissolve 2 Gm. in 10 cc. of distilled water, add, drop by drop, 5 cc. of hydrochloric acid, and evaporate to dryness on a water bath: the residue dissolved in 25 cc. of distilled water shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent).

Ammonia precipitate—Determine as described under *Anhydrous Potassium Carbonate*: the weight of the precipitate does not exceed 1.0 mg. (0.010 per cent).

Arsenic—Test 2 Gm. by the method described on page 554: the stain produced corresponds to not more than 0.006 mg. of As (3 parts per million).

Calcium and magnesium—Determine as described under *Anhydrous Potassium Carbonate*: the weight of the ignited residue does not exceed 1.5 mg. (0.015 per cent).

Heavy metals—Dissolve 2 Gm. in 10 cc. of distilled water, cautiously add 5 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 646. The heavy metals limit for Anhydrous Sodium Carbonate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 646.

Potassium—Dissolve 2 Gm. in a small volume of distilled water and neutralize with hydrochloric acid. Evaporate this solution to dryness on a water bath and redissolve the residue in 15 cc. of distilled water. Add 5 cc. of sodium cobaltinitrite T.S. and allow to stand over night. Any precipitate formed should not be greater than that produced by an amount of potassium chloride equivalent to 0.40 mg. of K, dissolved in 15 cc. of distilled water, treated with 5 cc. of sodium cobaltinitrite T.S. and allowed to stand over night (0.02 per cent of K).

Sodium Carbonate, Monohydrated, $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ —Use *Sodii Carbonas Monohydratus*, page 412.

Sodium Chloride, NaCl —Colorless, odorless, transparent crystals or a white powder.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent).

Neutrality—It meets the requirements of this test as described under *Potassium Chloride*, page 703.

Chlorate and nitrate—Dissolve 2 Gm. in 10 cc. of distilled water, add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color should not be entirely destroyed in 10 minutes (about 0.001 per cent as ClO_3 or 0.003 per cent as NO_3).

Nitrogen compounds—Dissolve 2 Gm. in 40 cc. of distilled water in a flask, add 10 cc. of 10 per cent sodium hydroxide solution and about 0.5 Gm. of aluminum wire in small pieces. Allow to stand for 3 hours protected against loss or access of ammonia. Then decant 25 cc. and add 2 cc. of Nessler's reagent: any color produced should not be greater than that produced by a quantity of an ammonium salt containing 0.01 mg. of nitrogen. Correction must be made for any nitrogen in the reagents used (0.001 per cent of N).

Phosphate—Dissolve 10 Gm. in 40 cc. of distilled water and 15 cc. of nitric acid. Evaporate to dryness, take up with 15 cc. of distilled water and 5 cc. of nitric acid, and again evaporate to dryness. Take up with 10 cc. of nitric acid, dilute with 50 cc. of distilled water, and nearly neutralize with ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake (at about 40°C.) for 5 minutes, and allow to stand for 30 minutes. Any precipitate formed is not greater than is produced in a blank made with 0.05 mg. of PO_4 (0.0005 per cent).

Sulfate—Dissolve 10 Gm. in 100 cc. of distilled water, add 1 cc. of hydrochloric acid, heat to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night: no turbidity or precipitate is produced.

Ammonium hydroxide precipitate—Dissolve 10 Gm. in about 100 cc. of distilled water, add a few drops of ammonia T.S., and boil gently in a covered beaker until the ammonia is expelled: no precipitate should be formed.

Barium—It meets the requirements of the test described under *Potassium Chloride*, page 703.

Calcium and magnesium—To the solution obtained in the test for *ammonium hydroxide precipitate* add 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S. and 20 cc. of ammonia T.S., and allow to stand over night. If a precipitate is formed, filter through a small paper, wash with distilled water containing 2.5 per cent of ammonia, ignite, and weigh: the weight should not exceed 0.5 mg. (0.005 per cent).

Heavy metals—The heavy metals limit for Sodium Chloride is 5 parts per million, using 3 Gm. for the test, page 646.

Iron—The iron in 3 Gm. corresponds to not more than 0.010 mg. of Fe (about 3 parts per million), page 646.

Potassium—Dissolve 5 Gm. in 20 cc. of distilled water, add 5 cc. of sodium cobaltinitrite T.S., and allow to stand over night: any precipitate formed should not be greater than that produced by an amount of potassium chloride equivalent to 0.50 mg. of K dissolved in 20 cc. of distilled water, treated with 5 cc. of the same sodium cobaltic nitrite T.S. as used in the test, and allowed to stand over night (0.01 per cent of K).

Sodium Dichromate, $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ (for *chromic acid cleaning mixture*)—Orange red crystals or granules. Very soluble in water; insoluble in alcohol.

Assay—Proceed as directed in the *assay of Chromii Trioxidum*, page 135, using about 1.5 Gm. of the sodium dichromate, accurately weighed. Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.004968 Gm. of $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$. Not less than 99 per cent of $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ should be found.

Sodium Diethyl-Dithiocarbamate, $(\text{C}_2\text{H}_5)_2\text{N} \cdot \text{CS}_2\text{Na}$ —White, or slightly brown, or slightly pink crystals. Freely soluble in water, or in alcohol. The aqueous solution is alkaline to phenolphthalein. The addition of acid to the aqueous solution (1 in 20) produces a white turbidity due to the formation of carbon disulfide.

Sodium Fluoride, NaF —A white, odorless powder, soluble in water.

Insoluble—Dissolve 2 Gm. in 100 cc. of warm distilled water in a platinum dish and allow to stand on a steam bath for 1 hour. Filter through asbestos in a Gooch crucible, wash thoroughly with hot distilled water, dry at 105° to 110°C ., and weigh. The weight should not exceed 1.0 mg. (0.050 per cent).

Loss on drying—When dried at 200°C . for 4 hours, the loss in weight corresponds to not more than 1 per cent.

Chloride—Dissolve 0.3 Gm. in 20 cc. of distilled water, add 0.2 Gm. of boric acid, 1 cc. of nitric acid, and 1 cc. of tenth-normal silver nitrate: any turbidity produced is not greater than that produced in a blank made with 0.03 mg. of Cl (0.01 per cent).

Free acid—Dissolve 2 Gm. in 40 cc. of distilled water in a platinum dish and add 10 cc. of a saturated solution of potassium nitrate. Cool the solution to 0°C ., and add 3 drops phenolphthalein T.S. If no pink color appears, titrate with tenth-normal sodium hydroxide until a pink color is produced which persists for 15 seconds: it requires not more than 2 cc. of the tenth-normal sodium hydroxide (0.2 per cent HF).

Free alkali—If a pink color is produced in the above test on the addition of the phenolphthalein T.S. titrate with tenth-normal acid, stirring the liquid only gently, until the pink color is discharged: not more than 0.5 cc. of the acid is required (0.25 per cent as Na_2CO_3).

Fluosilicate—After the solution from the preceding tests has been neutralized, heat it to boiling and titrate while hot with tenth-normal sodium hydroxide until a permanent pink color is obtained: it requires not more than 1.5 cc. of the tenth-normal sodium hydroxide (0.35 per cent Na_2SiF_6).

Sulfate—Evaporate 0.5 Gm. in a platinum dish 4 or 5 times, using 10 cc. of hydrochloric acid each time, and evaporating to dryness the last time: the residue shows no more sulfate than corresponds to 0.15 mg. of SO_4 (0.03 per cent SO_4), page 645.

Sulfite—Dissolve 6 Gm. in 150 cc. of distilled water, add 2 cc. of reagent hydrochloric acid, a few drops of starch T.S., and titrate immediately with tenth-normal iodine. It should require not more than 0.1 cc. to produce a blue color (0.005 per cent SO_3).

Heavy metals—Treat 2 Gm. in a platinum dish with 10 cc. of reagent hydrochloric acid and evaporate to dryness. Repeat with another 10 cc. of reagent hydrochloric acid. Warm the residue with a few drops of hydrochloric acid and dilute to 40 cc. Neutralize 20 cc. of this solution (keep the remainder for the iron test) with ammonia T.S. Add 1 cc. of tenth-normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S. Any brown color produced should not be greater than that produced by 0.03 mg. of lead in an equal volume of distilled water containing the same quantities of the same reagents used in the test (30 parts per million).

Iron—To the remaining 20 cc. from the test for *heavy metals* add 2 cc. of reagent hydrochloric acid, filter if necessary, and add 3 cc. of ammonium thiocyanate T.S. Any red color produced should be less than that produced by 0.03 mg. of Fe (30 parts per million).

Sodium Hydrosulfite, $\text{Na}_2\text{S}_2\text{O}_4$ —A white or grayish white crystalline powder. Soluble in water; slightly soluble in alcohol. It gradually oxidizes in the air, more readily when in solution, to bisulfite and bisulfate, acquiring an acid reaction. It is also affected by light.

Assay—Weigh accurately about 1 Gm. of Sodium Hydrosulfite, dissolve it in a mixture of 10 cc. of solution of formaldehyde and 10 cc. of distilled water contained in a small glass-stoppered flask, and allow to stand for 30 minutes with frequent agitation. Transfer the solution to a 250-cc. volumetric flask, add 150 cc. of distilled water and 3 drops of methyl orange T.S., and follow, drop by drop, with normal sulfuric acid to a slight acid reaction. Dilute with distilled water to 250 cc. and mix well. To 50 cc. of the dilution add 2 drops of phenolphthalein T.S. and just sufficient tenth-normal sodium hydroxide to produce a slight, pink color, then titrate with tenth-normal iodine, using starch T.S. as the indicator. Now discharge the blue color of the solution with a drop of tenth-normal sodium thiosulfate and then titrate with tenth-normal sodium hydroxide to a pink color. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.003482 Gm. of $\text{Na}_2\text{S}_2\text{O}_4$. It indicates not less than 88 per cent $\text{Na}_2\text{S}_2\text{O}_4$.

Sulfide—Add 10 per cent sodium hydroxide solution to lead acetate T.S. until the precipitate redissolves. Add 5 drops of this solution to a solution of 1 Gm. of the sodium hydrosulfite in 10 cc. of distilled water: there should be no immediate darkening.

Heavy metals—Dissolve 1 Gm. in 10 cc. of distilled water, add 10 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 20 cc. of distilled water and 0.5 cc. of diluted hydrochloric acid, filter, and add to the filtrate 10 cc. of hydrogen sulfide T.S.: no darkening is produced. Now make the solution alkaline with ammonia T.S.: a slight, greenish color may be produced, but not a dark or white precipitate.

Sodium Hydroxide, NaOH —Use *Sodii Hydroxidum*, page 415.

Sodium Nitrite, NaNO_2 —Use *Sodii Nitris*, page 417.

Sodium Nitroprusside (Sodium Nitroferricyanide), $\text{Na}_2\text{Fe}(\text{NO})(\text{CN})_5 \cdot 2\text{H}_2\text{O}$ —Transparent, dark red crystals, very soluble in water.

Insoluble—Dissolve 10 Gm. in 100 cc. of distilled water at room temperature, filter immediately, wash thoroughly, dry at 105° to 110° C., and weigh. The weight of the residue should not exceed 1.0 mg. (0.01 per cent).

Chloride—Test as described under *Potassium Ferricyanide*, page 706. If a turbidity is produced, it corresponds to not more than 0.15 mg. of Cl (0.03 per cent), page 645.

Sulfate—It complies with the test for *sulfate* as described under *Potassium Ferricyanide*, page 706.

Sodium Oxalate, $\text{Na}_2\text{C}_2\text{O}_4$ —A white, crystalline powder, slightly soluble in water.

Insoluble—The insoluble matter from 10 Gm., dissolved in 400 cc. of hot distilled water does not exceed 1.0 mg. (0.01 per cent), page 645.

Neutrality—Dissolve 2 Gm. in 150 cc. of carbon dioxide-free distilled water. Add 0.2 cc. of phenolphthalein T.S. and boil the solution in a flask of resistant glass for 10 minutes while passing through it a current of air free from carbon dioxide. Prepare a color standard by adding 0.2 cc. of phenolphthalein T.S. to 150 cc. of carbon dioxide-free distilled water, containing 10 cc. of tenth-normal sodium hydroxide, and diluting 6 cc. of this red liquid to 100 cc. with carbon dioxide-free distilled water. Titrate the hot sodium oxalate solution with one-hundredth-normal acid or alkali as required to bring its color to match that of the prepared standard. Not more than 0.8 cc. of one-hundredth-normal acid, or 0.4 cc. of one-hundredth-normal alkali should be required (limit of alkalinity, equivalent to 0.021 per cent of Na_2CO_3 ; limit of acidity, equivalent to 0.022 per cent of NaHC_2O_4).

Loss on drying—Dry 10 Gm. of the sodium oxalate to constant weight at 105° to 110° C.: the loss should not exceed 1.0 mg. (0.01 per cent).

Chloride—Ignite 2.5 Gm. to carbonate: dissolve this residue in 50 cc. of distilled water, neutralize with nitric acid, filter if necessary, and add sufficient distilled water to measure 100 cc. To 10 cc. of this solution in a test tube add 1 cc. of dilute nitric acid (1 volume of reagent nitric acid diluted with distilled water to 10 volumes) and 1 cc. of silver nitrate T.S.: the turbidity is not greater than that produced in a blank test by 0.005 mg. of Cl (0.002 per cent), page 645.

Sulfate—Ignite 10 Gm. in a platinum crucible protected from contamination with sulfur. Add to the residue 40 cc. of distilled water and 3 cc. of bromine T.S. and boil gently for a few minutes. Then add 20 cc. of hydrochloric acid and 20 mg. of sodium carbonate and evaporate to dryness on a steam bath. Dissolve the residue in 40 cc. of distilled water, add 1 cc. of normal hydrochloric acid, filter if necessary, and add to the filtrate 3 cc. of barium chloride T.S. Any resulting turbidity is not greater than that in a control made as follows: evaporate 20 cc. of hydrochloric acid, 3 cc. of bromine T.S. and 20 mg. of sodium carbonate to dryness on a steam bath, dissolve the residue and potassium sulfate, equivalent to 0.2 mg. of SO_4 , in 40 cc. of distilled water, and add 1 cc. of normal hydrochloric acid and 3 cc. of barium chloride T.S. (0.002 per cent SO_4).

Heavy metals—Test as described under *Potassium Oxalate*, page 709: it conforms to the limit for heavy metals there stated.

Iron—Ignite 5 Gm. to carbonate and dissolve the residue in 25 cc. of distilled water. Neutralize with hydrochloric acid and add an excess of 1 cc. of the hydrochloric acid. Add 1 drop of bromine and boil until nearly all of the color has disappeared. After the solution has cooled to room temperature, add sufficient distilled

water to measure 50 cc., and 5 cc. of ammonium thiocyanate T.S. Any resulting red color is not greater than that produced in a blank test by 0.05 Gm. of Fe (10 parts per million).

Potassium—Ignite 5 Gm. of the salt to carbonate in a platinum crucible, dissolve it in a small amount of distilled water, and neutralize the solution with hydrochloric acid. Evaporate this solution to dryness on a water bath and redissolve the residue in 15 cc. of distilled water. (This is to concentrate the solution and remove any free acid.) Add 5 cc. of sodium cobaltinitrite T.S. and allow to stand over night. Any precipitate formed should not be greater than that produced by an amount of potassium chloride equivalent to 0.50 mg. of K, dissolved in 15 cc. of distilled water, treated with 5 cc. of the same sodium cobaltinitrite T.S. as used in the test, and allowed to stand over night (0.01 per cent of K).

Substances darkened by hot sulfuric acid—Heat 1 Gm. in a recently ignited test tube with 10 cc. of reagent sulfuric acid until the appearance of fumes of sulfur trioxide: the acid should not acquire more than a faint, brownish tinge.

Sodium Peroxide, Na_2O_2 —A white, or yellowish white, very hygroscopic powder. It is freely soluble in water with the evolution of oxygen.

Assay—Weigh carefully about 0.7 Gm. and add slowly to a mixture of 400 cc. of distilled water and 5 cc. of sulfuric acid which has been cooled to 10°C . Dilute to 500 cc., mix well, and titrate 100 cc. with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.00390 Gm. of Na_2O_2 . It contains not less than 90 per cent of Na_2O_2 .

Chloride—Add 1 Gm., in small portions, to 20 cc. of distilled water, cool, add 5 cc. of nitric acid, filter, if necessary, and add 1 cc. of tenth-normal silver nitrate. If a turbidity is produced, it corresponds to not more than 0.02 mg. of Cl (0.002 per cent).

Nitrogen compounds—Dissolve 1 Gm. in 20 cc. of distilled water cooled with ice, add acetic acid until neutral, add an excess of 3 drops, and boil down to a volume of 10 cc. Cool, dilute with 25 cc. of distilled water, add 20 cc. of 10 per cent sodium hydroxide solution and 0.5 Gm. of aluminum wire in small pieces, and allow to stand for 3 hours protected against loss or access of ammonia. Decant 25 cc. of the clear liquid and add to it 2 cc. of Nessler's reagent: any color produced is not greater than that obtained by treating a quantity of a nitrate containing 0.030 mg. of N as in the test (0.003 per cent).

Sulfate—Dissolve carefully 20 Gm. in 200 cc. of distilled water, concentrate to about 100 cc., cool, neutralize to litmus paper with hydrochloric acid, and add an excess of 1 cc. of the acid. Filter if necessary, heat the filtrate to boiling, add 5 cc. of barium chloride solution, heat on a water bath for 2 hours, and allow to stand for 18 hours. If a precipitate is formed, filter, wash, and ignite. The weight of the precipitate does not exceed 1.0 mg. (about 0.002 per cent as SO_4).

Heavy metals—Carefully add 2 Gm. to a mixture of 5 cc. of hydrochloric acid and 15 cc. of distilled water and evaporate to dryness. Dissolve the residue in 25 cc. of distilled water and saturate with hydrogen sulfide. Any brown color produced should not be darker than that produced by 0.04 mg. of lead under the same conditions (20 parts per million).

Iron—Carefully add 1 Gm. to a mixture of 2 cc. of nitric acid and 10 cc. of distilled water and evaporate to dryness. Treat the residue with 2 cc. of hydrochloric

acid and 10 cc. of distilled water, warming slightly. Cool, dilute to 20 cc., and add 3 cc. of ammonium thiocyanate T.S. Any red color should not be greater than that produced by 0.03 mg. of Fe under the same conditions (30 parts per million).

Sodium Sulfate, Anhydrous, Na_2SO_4 (for dehydrating liquids)—White, fine powder. Soluble in water; insoluble in alcohol.

Insoluble—The insoluble matter from 5 Gm. is not more than 1 mg. (0.02 per cent).

Loss on ignition—Ignite about 2 Gm., accurately weighed, to constant weight: the loss in weight does not exceed 0.5 per cent.

Free alkali, free acid—Dissolve 5 Gm. in 60 cc. of carbon dioxide-free distilled water and add 3 drops of phenolphthalein T.S.: no pink color is produced. Now add 0.5 cc. of fiftieth-normal sodium hydroxide: a pink color is produced.

Alcohol-soluble substances—Shake 2 Gm. with 20 cc. of alcohol for 5 minutes and allow to stand for 1 hour with frequent agitation. Filter through a filter paper moistened with alcohol, evaporate the filtrate in a tared dish, and dry at 110°C . for 2 hours. The weight of the residue does not exceed 1 mg. (0.05 per cent).

Sodium Sulfide, $\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$ —Clear, colorless, deliquescent crystals. Very soluble in water. An aqueous solution (1 in 10) is alkaline to litmus paper and has the odor of hydrogen sulfide.

Ammonium compounds—Dissolve 2 Gm. in 80 cc. of distilled water, add a solution of 3.5 Gm. of lead acetate in 20 cc. of distilled water, and allow the precipitate to settle. Decant 50 cc. of this solution, add an excess of sodium hydroxide T.S. and then distilled water to make 100 cc. Distil off 50 cc. and add to the distillate 2 cc. of Nessler's reagent: the color should not be greater than that produced by a quantity of an ammonium salt containing 0.02 mg. of nitrogen, after correction is made for any nitrogen in the lead acetate, sodium hydroxide, and distilled water used in the test (0.002 per cent N).

Sulfite and thiosulfate—Dissolve 3 Gm. in 200 cc. of distilled water, free from oxygen, and add a solution of 5 Gm. of zinc sulfate in 100 cc. of distilled water, free from oxygen. Shake the mixture well, allow to stand for 30 minutes, filter, and titrate 100 cc. of the filtrate with tenth-normal iodine, using starch T.S. as the indicator: not more than 0.3 cc. of the iodine solution should be required (about 0.10 per cent as SO_2).

Iron—Dissolve 5 Gm. in 100 cc. of distilled water. The solution should be clear and colorless.

Sodium Sulfite, Anhydrous (Exsiccated Sodium Sulfite), Na_2SO_3 —A white powder. Freely soluble in water, slightly soluble in alcohol.

Assay—Weigh accurately about 0.25 Gm. and add it to 50 cc. of tenth-normal iodine (the sulfite must be added to the iodine solution). After standing 5 minutes add 1 cc. of hydrochloric acid and titrate the excess iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 0.006303 Gm. of Na_2SO_3 . It contains not less than 95 per cent of Na_2SO_3 .

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 645.

Free acid—Dissolve 1 Gm. in 10 cc. of distilled water and add 2 drops of phenolphthalein T.S.: a pink color should be produced.

Free alkali—Dissolve 1 Gm. in 10 cc. of distilled water and add 1.5 cc. of 30 per

cent hydrogen peroxide solution which has been previously neutralized to methyl red T.S. Shake the mixture well and allow it to stand for 5 minutes. Titrate with tenth-normal acid, using methyl red T.S. as the indicator: not more than 0.6 cc. of the tenth-normal acid should be required to neutralize the solution (0.30 per cent as Na_2CO_3).

Chloride—Dissolve 0.5 Gm. in 10 cc. of distilled water, add 10 cc. of hydrogen peroxide T.S., and dilute with distilled water to 100 cc.: a 20-cc. portion of the solution shows no more chloride than corresponds to 0.02 mg. of Cl (0.02 per cent), page 645.

Arsenic—Dissolve 1 Gm. in 10 cc. of distilled water, add 1 cc. of reagent sulfuric acid, evaporate to about 1 cc. on a water bath, and test as described on page 554: the stain corresponds to not more than 0.002 mg. of As (0.0002 per cent).

Heavy metals—Dissolve 6 Gm. in 30 cc. of hot distilled water, add slowly 12 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Add 15 cc. of hot water and 3 cc. of hydrochloric acid, re-evaporate to complete dryness and dissolve the residue in 60 cc. of distilled water. To 10 cc. of the solution add 0.04 mg. of Pb, dilute to 30 cc. and add 2 cc. of diluted acetic acid (A). To 30 cc. of the remaining solution add 2 cc. of diluted acetic acid (B); then to each add 10 cc. of hydrogen sulfide T.S.: B is not darker than A (20 parts per million).

Iron—To the remaining 10 cc. of the solution from the preceding test, add 2 cc. of hydrochloric acid and 5 drops of bromine T.S. and boil to expel the excess of bromine. Cool, dilute with distilled water to 20 cc. and add 2 cc. of ammonium thiocyanate T.S.: any red color produced corresponds to not more than 0.01 mg. of Fe (10 parts per million).

Sodium Tartrate, $\text{Na}_2\text{C}_4\text{H}_4\text{O}_6 \cdot 2\text{H}_2\text{O}$ —Transparent crystals. Very soluble in water, insoluble in alcohol.

Free alkali or free acid—To a solution of 2 Gm. of the salt in 20 cc. of distilled water add 2 drops of phenolphthalein T.S. If a pink color is produced, it should be discharged by not more than 0.1 cc. of tenth-normal acid; if no pink color is produced, the addition of not more than 0.1 cc. of tenth-normal sodium hydroxide should produce a pink color.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.15 mg. of Cl (0.015 per cent), page 645.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 645.

Heavy metals—The heavy metals limit for Sodium Tartrate is 10 parts per million, using 2 Gm. for the test and acidulating with 2 cc. of normal hydrochloric acid, page 646.

Sodium Thiosulfate, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ —Use *Sodii Thiosulfas*, page 423.

Sodium Tungstate, $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$ —Colorless crystals, crystalline lumps, or a white, crystalline powder.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.5 mg. (0.015 per cent), page 645.

Alkalinity—Dissolve 2 Gm. in 50 cc. of cold distilled water and add 2 drops of phenolphthalein T.S.: a pink color should be produced which should be discharged

by the addition of not more than 0.4 cc. of tenth-normal acid (0.20 per cent as Na_2CO_3).

Chloride—Dissolve 1 Gm. in 20 cc. of distilled water, add 5 cc. of nitric acid, filter, and add to the filtrate 1 cc. of tenth-normal silver nitrate. Any turbidity produced in 2 minutes is not greater than that produced in a blank test by 0.02 mg. of Cl (0.002 per cent), page 645.

Molybdenum—Dissolve 2 Gm. in 10 cc. of distilled water and render it slightly alkaline, if necessary, with dilute sodium hydroxide T.S. Dissolve in this solution 0.5 Gm. of potassium xanthate without warming. Add 10 cc. of chloroform, followed by dilute sulfuric acid (1 in 10), shaking after each addition until the color in the chloroform is no longer intensified. Any resulting color should not be greater than that produced by 0.03 mg. of molybdic anhydride (corresponding to 0.02 mg. of molybdenum) in an equal volume of solution containing the same quantities of the reagents used in the test (0.001 per cent of Mo).

Nitrogen compounds—Dissolve 3 Gm. in 40 cc. of distilled water, add 20 cc. of 10 per cent sodium hydroxide and 0.5 Gm. of aluminum wire. Allow to stand for 3 hours, protected from loss or absorption of ammonia, then decant 40 cc. of the liquid, and add to it 2 cc. of Nessler's reagent. The color produced is not darker than that of a control made by treating a quantity of ammonium chloride equivalent to 0.02 mg. of nitrogen in the same manner as the sodium tungstate (0.001 per cent).

Sulfate—Dissolve 2 Gm. in 15 cc. of distilled water, add 5 cc. of nitric acid, evaporate to dryness on a water bath, and heat at 110°C . for 30 minutes. Warm the residue with 25 cc. of distilled water and 1 cc. of hydrochloric acid, dilute to 50 cc. with distilled water and filter. To 25 cc. of the filtrate add 2 cc. of barium chloride T.S.: any turbidity produced in 10 minutes is not greater than that produced in a blank test by 0.2 mg. of SO_4 (0.02 per cent), page 645.

Heavy metals—Dissolve 1 Gm. in 20 cc. of distilled water. Add 2 cc. of ammonia T.S. and 5 cc. of hydrogen sulfide T.S.: no brown color is produced. If a green color is produced, it corresponds to not more than 0.02 mg. of Fe (20 parts per million), page 646.

Stannous Chloride, $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$ —Colorless crystals, very soluble in water. The aqueous solution requires the presence of some hydrochloric acid to prevent the formation of basic chloride.

Insoluble in hydrochloric acid—Heat 5 Gm. to 40°C . in a mixture of 5 cc. of distilled water and 5 cc. of hydrochloric acid: complete solution results.

Sulfate—Dissolve 5 Gm. in 5 cc. of reagent hydrochloric acid, dilute the solution to 50 cc. with distilled water, heat to boiling, add 5 cc. of barium chloride T.S., and allow the mixture to stand over night: no precipitate should be formed (about 0.003 per cent SO_4).

Ammonium compounds—Gently heat about 0.1 Gm. with 5 cc. of sodium hydroxide T.S.: the escaping vapors do not turn moistened red litmus paper blue.

Arsenic—Dissolve 5 Gm. in 10 cc. of hydrochloric acid, heat to boiling, and allow it to stand for 1 hour. The solution should have no more color than a freshly prepared solution of 5 Gm. of Stannous Chloride in 10 cc. of hydrochloric acid (about 2 parts per million).

Substances not precipitated by hydrogen sulfide—Dissolve 4 Gm. in 10 cc. of hydrochloric acid, dilute to 200 cc., and precipitate the tin with hydrogen sulfide. Filter

and evaporate 100 cc. of the filtrate to a few cc., add a few drops of sulfuric acid, evaporate to dryness, ignite gently, and weigh: the weight of the residue should not exceed 1.0 mg. (0.050 per cent).

Iron—Warm the residue obtained in the previous test with 1 cc. of hydrochloric acid and a small crystal of potassium chlorate until chlorine is no longer evolved. Dilute with 20 cc. of distilled water, add 2 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S.: the red color should not be greater than that produced by 0.06 mg. of Fe under the same conditions (30 parts per million).

Other metals—Dissolve 1 Gm. in a mixture of 2 cc. of hydrochloric acid and 3 cc. of nitric acid. Boil until solution is complete and brown fumes are no longer given off in abundance. Cool and dilute with distilled water to 10 cc. To 5 cc. add 10 per cent sodium hydroxide solution until the precipitate first formed is redissolved. Cool, dilute to 40 cc. with distilled water, and add 10 cc. of hydrogen sulfide T.S. Any brown color in the mixture is not greater than that produced in a blank test by 0.1 mg. of lead (100 parts per million).

Starch, Arrowroot—The starch separated from the root of *Maranta arundinacea* Linné (Fam. *Marantaceæ*). A white powder consisting of starch grains of characteristic shape and appearance when examined microscopically.

Sensitiveness—Mix 100 cc. of distilled water with 10 cc. of potassium iodide solution (1 in 100) and add 3 cc. of starch (arrowroot) T.S. (page 742). On the addition of 0.1 cc. of two-hundredth-normal iodine to the mixture a distinct blue color is produced.

Starch, Potato—The starch separated from the tubers of *Solanum tuberosum* Linné (Fam. *Solanaceæ*). A more or less finely granular powder, consisting of starch grains of characteristic shape and appearance when examined microscopically.

Sucrose, $C_{12}H_{22}O_{11}$ —Use *Sucrosum*, page 437.

Sulfanilic Acid, $C_6H_4NH_2(SO_3H).2H_2O$ —Colorless, acicular, efflorescent crystals. Sparingly soluble in water, very slightly soluble in alcohol and in ether.

Insoluble in sodium carbonate solution—Dissolve 5 Gm. in 50 cc. of a clear 5 per cent solution of sodium carbonate (anhydrous), and allow it to stand for 1 hour. If an insoluble residue remains, filter, wash with cold distilled water, and dry at 105° C.: the weight of the residue should not exceed 1.0 mg. (not more than 0.02 per cent).

Residue on ignition—Ignite 3 Gm.: the weight of the residue should not exceed 1.0 mg. (0.03 per cent).

Chloride—Boil 4 Gm. with 100 cc. of distilled water until dissolved, cool, dilute with distilled water to 100 cc., mix well, and filter. A 25-cc. portion of this filtrate shows no more chloride than 0.02 mg. of Cl (0.002 per cent), page 645.

Sulfate—Evaporate 50 cc. of the filtrate, used in the *chloride* test, to about 20 cc. Cool on ice, filter, and wash with distilled water to 25 cc. The filtrate shows no more sulfate than corresponds to 0.2 mg. of SO_4 (0.01 per cent), page 645.

Nitrite—Add 0.5 Gm. to 50 cc. of distilled water and add 5 cc. of sulfanilic α -naphthylamine T.S. Heat on a water bath, shaking the mixture until the sulfanilic acid is in solution. This solution should show no more pink color than a blank containing 5 cc. of the reagent mixed with 50 cc. of distilled water (about 0.00005 per cent NO_2).

Sulfosalicylic Acid, $C_6H_3(OH)(SO_3H).COOH.2H_2O$ —White or not more than slightly pinkish, needle-like crystals or a crystalline powder. Soluble in water and in alcohol.

Assay—Weigh accurately about 0.5 Gm. of the acid, dried at from 105° to 110° C., to constant weight, dissolve it in 50 cc. of distilled water, and titrate with tenth-normal alkali, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal alkali is equivalent to 0.0109 Gm. of $C_6H_3.OH.SO_3H.COOH$. It shows not less than 99 per cent of $C_6H_3.OH.SO_3H.COOH$.

Residue on ignition—Ignite 1 Gm. to constant weight: not more than 1.5 mg. of residue remains (0.15 per cent).

Sulfate—The sulfate in 0.5 Gm. corresponds to not more than 0.3 mg. of SO_4 (0.06 per cent), page 645.

Salicylic acid—Dissolve 2 Gm. of the acid in 20 cc. of distilled water in a separator, add 5 drops of reagent hydrochloric acid, and extract the solution with 10 cc. of chloroform. Draw off the chloroform, wash the chloroform twice with 3 cc. of distilled water, then filter through a small filter, moistened with chloroform, into a weighed dish, and evaporate the chloroform completely at a temperature not above 60° C. The weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Loss on drying—Weigh accurately about 1 Gm., dry at 105° to 110° C. to constant weight: the loss in weight does not exceed 16 per cent.

Sulfur, S—Use *Sulfur Præcipitatum*, page 445.

Sulfuric Acid, Reagent, H_2SO_4 —A colorless, odorless liquid of oily consistency.

Mix the Acid in the original container and transfer 10 cc. to a test tube (150 mm. by 20 mm.). Compare it with distilled water in a similar tube. The liquids should be equally clear and free from suspended matter, and on looking across the columns by transmitted light there should be no apparent difference in color. Cautiously dilute a portion of the Acid with distilled water until about double-normal, and compare as before. No difference in turbidity should be observed.

Assay—When assayed by the method outlined under *Acidum Sulfuricum*, page 30, it contains not less than 94 per cent of H_2SO_4 .

Non-volatile matter—Evaporate 55 cc. of the Acid to dryness in platinum, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 0.5 mg. (0.0005 per cent).

Chloride—Dilute 5 cc. of the Acid to 50 cc. and cool. Add 1 cc. of nitric acid (1 in 10) and 1 cc. of silver nitrate T.S. The turbidity should not be greater than that produced by 0.005 mg. of chloride ion in 50 cc. of distilled water to which are added 1 cc. of dilute nitric acid (1 in 10) and 1 cc. of tenth-normal silver nitrate (0.00005 per cent of Cl).

Nitrate—Add 10 cc. of the acid to 5 cc. of distilled water containing 0.10 cc. of indigo carmine solution T.S. (1 in 1000). The blue color should not be completely discharged in 5 minutes (about 0.0002 per cent).

Ammonia—Dilute 3 cc. of the Acid with 30 cc. of distilled water, render alkaline with 30 per cent solution of sodium hydroxide, and add 1 cc. of Nessler's reagent: the color is not more intense than is produced in a blank made with a quantity of ammonium chloride corresponding to 0.015 mg. of NH_3 (0.0003 per cent NH_3).

Arsenic—Add 3 cc. of nitric acid to 55 cc. of the Acid and evaporate to about 10 cc. A second or third evaporation to the production of fumes, after dilution,

may be necessary to remove all of the nitrate. Cool, dilute the residue with 40 cc. of distilled water, and determine the arsenic as outlined on page 554. Special care in making blank tests is necessary in this determination. The stain produced corresponds to not more than 0.003 mg. of As (0.03 parts per million).

Heavy metals—Dilute 5 cc. of the Acid to 50 cc. with distilled water, saturate with hydrogen sulfide, and make alkaline with ammonia T.S.: no brown color is produced. If a greenish color is produced, it is not greater than that produced in a blank test by a volume of standard ferric ammonium sulfate, corresponding to 0.01 mg. of Fe (1 part per million).

Substances oxidizable by permanganate—Dilute 20 cc. of the Acid with 60 cc. of distilled water, cool to 25° C., and add 0.05 cc. of tenth-normal potassium permanganate: the mixture should remain pink for not less than 5 minutes (about 0.0005 per cent as SO_2).

Sulfuric Acid, Diluted (10 per cent)—Cautiously add 57 cc. of reagent sulfuric acid to about 100 cc. of distilled water, cool to room temperature and dilute with distilled water to 1000 cc.

Sulfuric Acid, Fuming, H_2SO_4 plus free SO_3 —A heavy, fuming, colorless, oily liquid.

Assay—Accurately weigh a glass-stoppered flask containing about 50 cc. of distilled water, then cautiously add about 1 cc. of the Acid, and reweigh. Titrate with normal sodium hydroxide, using methyl orange as the indicator. It shows not less than 84 per cent of total sulfur trioxide. Each cc. of normal sodium hydroxide is equivalent to 0.04003 Gm. of SO_3 .

Non-volatile matter—Evaporate 5 cc. in a platinum dish and ignite at cherry redness for 5 minutes. Cool and weigh: the weight of the residue does not exceed 2.0 mg. (0.02 per cent).

Nitrate—Cautiously add 3 cc. of the Acid to 5 cc. of distilled water. To the mixture, while still hot, add about 5 mg. of sodium chloride and 2 drops of indigo carmine T.S.: the blue color is not discharged in 5 minutes (0.002 per cent NO_3).

Sulfurous Acid, H_2SO_3 —An aqueous solution having the odor of sulfur dioxide. It oxidizes in the air. Keep in small bottles.

Assay—Tare a glass-stoppered, Erlenmeyer flask containing 50 cc. of tenth-normal iodine. Quickly add about 2 cc. of the Acid, stopper, and weigh. Titrate the excess of iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. It contains not less than 6 per cent of SO_2 .

Non-volatile matter—Evaporate 20 cc. to dryness, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 1.0 mg. (0.005 per cent).

Chloride—Digest 10 cc. with 2 cc. of nitric acid on a water bath for 1 hour and dilute with distilled water to 25 cc.: this solution shows no more chloride than corresponds to 0.05 mg. of Cl (0.0005 per cent), page 645.

Arsenic—Mix 5 cc. with 0.5 cc. of sulfuric acid and evaporate on a water bath until free from sulfur dioxide and the volume has been reduced to about 2 cc. Dilute to 5 cc. and test as described on page 554. The stain produced corresponds to not more than 0.0025 mg. of As (0.5 parts per million).

Heavy metals—Dilute 5 cc. (5 Gm.) with 15 cc. of distilled water and boil gently to remove SO_2 . Cool, add a drop of phenolphthalein T.S. and follow with diluted

ammonia T.S. until slightly pink. Add 0.5 cc. of normal hydrochloric acid and dilute with distilled water to 30 cc. The heavy metals limit for sulfurous acid is 10 parts per million.

Iron—Evaporate 2 cc. to dryness on a steam bath, add 1 cc. of hydrochloric acid and 5 drops of nitric acid and re-evaporate to dryness on the steam bath. Warm the residue with 2 cc. of hydrochloric acid, dilute with distilled water to 20 cc. and add 2 cc. of ammonium thiocyanate T.S.: any red color produced corresponds to not more than 0.01 mg. of Fe (5 parts per million).

Tannic Acid—Use *Acidum Tannicum*, page 31.

Tartaric Acid, $C_2H_2(OH)_2(COOH)_2$ —Use *Acidum Tartaricum*, page 32.

Tetrachlorobenzoquinone—See *Chloranil*, page 666.

Thorium Nitrate, $Th(NO_3)_4$, with a variable amount of water—Colorless or white crystals or granules; slightly deliquescent. Very soluble in water, the solution having a strongly acid reaction.

Insoluble—One Gm. dissolves completely, or practically completely, in 10 cc. of water.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.03 mg. of Cl (0.003 per cent), page 645.

Sulfate—Dissolve 0.5 Gm. in a few cc. of distilled water, add 3 cc. of hydrochloric acid, and evaporate to dryness on a water bath. Re-evaporate with 2 cc. of hydrochloric acid and dissolve the residue in 250 cc. of distilled water. Dilute 10 cc. with 15 cc. of distilled water, add 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. If a turbidity is produced it corresponds to not more than 0.1 mg. of SO_4 (about 0.5 per cent).

Aluminum—Dissolve 1 Gm. in 100 cc. of distilled water and add 2 cc. of diluted sulfuric acid. Heat the solution to boiling and add 20 cc. of a hot 10 per cent aqueous solution of oxalic acid. Allow to cool, and filter. Add ammonia T.S. to the filtrate until slightly alkaline and heat to boiling: no precipitate is formed.

Heavy metals—Dissolve 1 Gm. in 15 cc. of distilled water, add, drop by drop, dilute ammonia T.S. until the solution is neutral to litmus paper. Then heat it to boiling and add diluted hydrochloric acid, drop by drop, until the precipitate just dissolves. Cool, dilute to 25 cc., and add 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Tin, Sn—In the form of almost silver white granules, or irregular fragments.

Lead—Digest 5 Gm. of the metal with 40 cc. of reagent nitric acid on a water bath until the metal is entirely converted into the oxide, then evaporate to dryness. Stir the residue with 5 cc. of nitric acid and 50 cc. of distilled water, and filter. Add to the filtrate 1 cc. of sulfuric acid, then evaporate, and heat to the production of copious evolution of fumes of sulfur trioxide, and cautiously add 10 cc. of distilled water. If an undissolved residue remains, collect it in a Gooch crucible, previously ignited to constant weight, wash with about 10 cc. of cold distilled water (retain filtrate and washings), and ignite gently to constant weight: the weight of the insoluble residue should not exceed 3.5 mg. (0.05 per cent of Pb).

Arsenic—One-fifth of the mixed filtrate and washings from the test for lead (corresponding to 1.0 Gm. of the tin) subjected to the arsenic test as outlined on page 554, shows not more than 2 parts per million.

Other metals—To the remainder of the filtrate and washings from the *lead* test, add ammonia T.S. to a slight alkaline reaction, then add 1 or 2 cc. of ammonium sulfide T.S. If a precipitate is produced, collect it in a Gooch crucible, previously washed and ignited to constant weight, wash with distilled water containing some ammonium sulfide and ignite to constant weight: the weight of the residue does not exceed 2.0 mg. (0.05 per cent).

Toluene (*Toluol*), $C_6H_5.CH_3$ —A colorless, highly refractive, inflammable liquid. Insoluble in water, miscible with alcohol, ether, chloroform, carbon disulfide, and with petroleum benzin. Specific gravity: about 0.865, at $25^\circ C$.

Boiling range—Distil 100 cc. by method II, page 559: not less than 95 cc. distills between 110° and $111^\circ C$.

Non-volatile matter—Evaporate 115 cc. on a water bath and dry at from 105° to $110^\circ C$. for 30 minutes: the weight of the residue should not exceed 2.0 mg. (not more than 0.002 per cent).

Water—Cool the Toluene in a dry, tightly stoppered test tube in crushed ice: no cloudiness should be observed. Special care must be taken in handling the Toluene before as well as during this test to prevent moisture from being absorbed from the air.

Sulfur compounds—Determine as described under *Benzene*, page 659: the weight of the barium sulfate is not more than 1.2 mg. (0.003 per cent of S).

Substances darkened by sulfuric acid—Shake 15 cc. with 5 cc. of reagent sulfuric acid for from 15 to 20 seconds and allow to stand 15 minutes. The toluene layer should be colorless and the color of the acid should not exceed that of a mixture of 2 volumes of distilled water and 1 volume of a color standard containing 5 Gm. of $CoCl_2 \cdot 6H_2O$, 40 Gm. of $FeCl_3 \cdot 6H_2O$, and 20 cc. of hydrochloric acid in 1000 cc.

Trinitrophenol (*Picric Acid*), $C_6H_2(OH)(NO_2)_3$ —Use *Trinitrophenol*, page 529.

Uranyl Acetate (*Uranium Acetate*), $UO_2(C_2H_3O_2)_2 \cdot 2H_2O$ —Yellow, crystalline powder, having a slight odor of acetic acid. Soluble in water, usually requiring the addition of a little acetic acid to effect complete solution.

Insoluble—The insoluble matter from 5 Gm. dissolved in 100 cc. of cold distilled water is not more than 1.0 mg. (0.02 per cent), page 645.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.15 mg. of Cl (0.015 per cent), page 645.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 645.

Alkali and earths—Ignite 2 Gm. until thoroughly decomposed. Powder the residue and boil for 10 minutes with 50 cc. of distilled water. Cool, dilute to 50 cc., mix well, and filter. To 25 cc. of the filtrate add a few drops of reagent sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.1 per cent as sulfate).

Heavy metals—Dissolve 2 Gm. in 30 cc. of distilled water, add 1 cc. of normal hydrochloric acid, and divide into 2 equal portions. To one portion add 5 cc. of hydrogen sulfide T.S. and to the other portion add 5 cc. of distilled water. The portion treated with hydrogen sulfide shows no appreciable darkening when compared with the other portion.

Uranous compounds—Dissolve 2 Gm. of the salt in 50 cc. of distilled water, add 2 cc. of reagent sulfuric acid, and divide the solution into 2 equal parts. Add to one part tenth-normal potassium permanganate until a change in color is produced by comparison with the other part. Not more than 0.3 cc. of the potassium permanganate solution is required to produce the change.

Xylene, C_8H_{10} —A colorless, transparent liquid, insoluble in water, very soluble in alcohol and in ether. Specific gravity: 0.85, at 25° C.

Boiling range—Distil 100 cc. by method II, page 559: not less than 95 cc. distills between 137° and 140° C.

Non-volatile matter—Evaporate 115 cc. on a water bath and dry at from 105° to 110° C. for 30 minutes: the weight of the residue should not exceed 2.0 mg. (0.002 per cent).

Water—It meets the requirements for this test under *Toluene*, page 730.

Sulfur compounds—Determine as described under *Benzene*, page 659: the weight of the barium sulfate does not exceed 1.2 mg. (0.003 per cent of S).

Substances darkened by sulfuric acid—Shake 15 cc. with 5 cc. of reagent sulfuric acid for from 15 to 20 seconds and allow to stand for 15 minutes. The xylene layer should be colorless, and the color of the acid should not exceed that of a mixture of 1 volume of distilled water and 3 volumes of a color standard containing 5 Gm. of $CoCl_2 \cdot 6H_2O$, 40 Gm. of $FeCl_3 \cdot 6H_2O$, and 20 cc. of hydrochloric acid in 1000 cc.

Zinc, Zn—Zinc in the form of globules, irregular fragments, granules, or as a fine powder known as *Zinc Dust*. The tests described below are not required for the fine powder.

Arsenic—Test 10 Gm. by the method described on page 554, using 12 cc. of reagent sulfuric acid, diluted with about 70 cc. of distilled water: any stain produced is not greater than that produced by 0.002 mg. of As (0.2 parts per million).

Iron (substances oxidized by permanganate as Fe)—Heat 10 Gm. with a mixture of 15 cc. of reagent sulfuric acid and 100 cc. of distilled water in a flask provided with a rubber valve. When the zinc has dissolved, titrate the solution with tenth-normal potassium permanganate: not more than 0.3 cc. should be required to produce a pink color, correcting for the blank test and end-point (0.017 per cent as Fe).

Insoluble in sulfuric acid—If an insoluble residue remains when the zinc is dissolved in the test for *iron*, filter the solution, after titration with permanganate, wash the residue with hot distilled water, and dry it at from 105° to 110° C.: its weight should not exceed 50.0 mg. (0.50 per cent).

Zinc Sulfate, $ZnSO_4$ —Use *Zinci Sulfas*, page 548.

Test Solutions (T.S.)

For the preparation of Test Solutions reagents of the quality described under *Reagents*, pages 645 to 731, are to be used.

Wherever possible and desirable, the concentrations of the following test solutions have been adjusted approximately to a normality basis.

Albumen Test Solution—Carefully separate the white from the yolk of a strictly

fresh hen's egg. Shake the white with 100 cc. of distilled water until thoroughly mixed and all but the chalaza has undergone solution; filter. This solution must be freshly prepared.

Alcohol-Phenol Test Solution—Dissolve 0.78 Gm. of phenol in sufficient alcohol to make 100 cc.

Alkaline Cupric Iodide Test Solution—Dissolve 7.5 Gm. of cupric sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in about 100 cc. of distilled water. In a separate container dissolve 25 Gm. of anhydrous sodium carbonate, 20 Gm. of sodium bicarbonate, and 25 Gm. of potassium and sodium tartrate in about 600 cc. of distilled water. With constant stirring add the cupric sulfate solution to the bottom of the alkaline tartrate solution by means of a funnel which touches the bottom of the container. Add 1.5 Gm. of potassium iodide, 200 Gm. of anhydrous sodium sulfate, 50 to 150 cc. of sixtieth-molar potassium iodate, and sufficient distilled water to make 1000 cc. (The amount of iodate solution required depends on the blood-sugar concentration and the volume of blood filtrate used.)

Alkaline Cupric Tartrate Test Solution (*Fehling's Solution*)—*A*—*The Copper Solution*—Dissolve 34.66 Gm. of carefully selected, small crystals of cupric sulfate, showing no trace of efflorescence or of adhering moisture, in sufficient distilled water to make 500 cc. Keep this solution in small, well-stoppered bottles.

B—*The Alkaline Tartrate Solution*—Dissolve 173 Gm. of crystallized potassium and sodium tartrate and 50 Gm. of sodium hydroxide in sufficient distilled water to make 500 cc. Keep the solution in small, rubber-stoppered bottles.

For use, mix exactly equal volumes of the two solutions at the time required.

Ammonia Test Solution—It contains not less than 9.5 per cent and not more than 10.5 per cent of NH_3 . It is prepared by diluting 395 cc. of *Stronger Reagent Ammonia Water*, page 649, with sufficient distilled water to make 1000 cc.

Ammonia Test Solution, Alcoholic—A solution of ammonia gas in alcohol. A clear, colorless liquid having a strong odor of ammonia. Specific gravity, about 0.80 at 25° C. When assayed by the method directed under *Liquor Ammonia Dilutus*, it shows not less than 9 per cent and not more than 11 per cent by weight of NH_3 . Preserve in rubber-stoppered or greased glass-stoppered bottles in a cool place.

Ammonia Test Solution, Stronger—Use *Stronger Reagent Ammonia Water*, page 649.

Ammonium Carbonate Test Solution—Dissolve 20 Gm. of reagent ammonium carbonate and 20 cc. of ammonia T.S. in sufficient distilled water to make 100 cc.

Ammonium Chloride Test Solution (2 N.)—Dissolve 10.5 Gm. of reagent ammonium chloride in sufficient distilled water to make 100 cc.

Ammonium Chloride-Ammonium Hydroxide Test Solution—Mix equal volumes of distilled water and strong solution of ammonia, and saturate with ammonium chloride.

Ammonium Cyanide Solution—See page 594.

Ammonium Molybdate Test Solution—Dissolve 6.5 Gm. of finely powdered molybdic acid in a mixture of 14 cc. of distilled water and 14.5 cc. of stronger ammonia T.S. Cool the solution and add it slowly, with stirring, to a well-cooled mix-

ture of 32 cc. of nitric acid, and 40 cc. of distilled water. Allow to stand for 48 hours and filter through asbestos. This solution deteriorates upon standing. If, upon the addition of 2 cc. of sodium phosphate T.S. to 5 cc. of the solution, an abundant yellow precipitate does not form at once or after slight warming, the solution should not be used. Preserve in the dark; if a precipitate forms, use only the clear, decanted solution.

Ammonium Oxalate Test Solution (0.5 N.)—Dissolve 3.5 Gm. of ammonium oxalate in sufficient distilled water to make 100 cc.

Ammonium Phosphate, Dibasic, Test Solution (1 N.)—Dissolve 13 Gm. of dibasic ammonium phosphate in sufficient distilled water to make 100 cc.

Ammonium Polysulfide Test Solution—A yellow liquid, made by saturating ammonium sulfide T.S. with sulfur.

Ammonium Sulfide Test Solution—Saturate ammonia T.S. with hydrogen sulfide and add two-thirds of its volume of ammonia T.S. Residue upon ignition, not over 0.05 per cent. The solution is not rendered turbid either by magnesium sulfate T.S. or by calcium chloride T.S. (*carbonate*).

This solution must not be used if an abundant precipitate of sulfur is present. Preserve in small, well-filled, dark amber-colored bottles, in a cool, dark place.

Ammonium Thiocyanate Test Solution (approximately 1 N.)—Dissolve 8 Gm. of ammonium thiocyanate in sufficient distilled water to make 100 cc.

Aniline Sulfate Test Solution—Dissolve 5 Gm. of aniline sulfate in 25 cc. of alcohol, and add sufficient distilled water to make 100 cc.

Barfoed's Reagent—(See *Cupric Acetate Test Solution*, *Stronger*, page 734.)

Barium Chloride Test Solution (1 N.)—Dissolve 12 Gm. of barium chloride in sufficient distilled water to make 100 cc.

Barium Hydroxide Test Solution (0.5 N.)—A saturated solution of barium hydroxide in recently boiled distilled water. This test solution must be freshly prepared.

Barium Nitrate Test Solution (0.5 N.)—Dissolve 6.5 Gm. of barium nitrate in sufficient distilled water to make 100 cc.

Bromine Test Solution (*Bromine Water*)—A saturated aqueous solution of bromine, prepared by agitating from 2 to 3 cc. of bromine with 100 cc. of cold distilled water in a glass-stoppered bottle, the stopper of which should be lubricated with petrolatum. Preserve in a cool place, protected from light.

Calcium Chloride Test Solution (1 N.)—Dissolve 7.5 Gm. of calcium chloride in sufficient distilled water to make 100 cc.

Calcium Hydroxide Test Solution (0.04 N.)—Use *Liquor Calcii Hydroxidi*, page 261.

Calcium Sulfate Test Solution—A saturated solution of calcium sulfate in distilled water.

Chloral Hydrate Test Solution—Dissolve 50 Gm. of chloral hydrate in 15 cc. of distilled water and 10 cc. of glycerin.

Chlorine Test Solution (*Chlorine Water*)—A saturated solution of chlorine in distilled water. The solution should be kept in small, dark amber-colored, glass-stoppered bottles, which should be completely filled. Chlorine T.S., even when kept from light and air, is apt to deteriorate. When full strength is required, it must be freshly prepared. Preserve in a dark, cool place.

Chromotropic Acid Test Solution—Dissolve 50 mg. of chromotropic acid or its sodium salt in 100 cc. of 75 per cent sulfuric acid. (This acid may be made by cautiously adding 90 cc. of sulfuric acid to 40 cc. of distilled water.)

Cobaltous Chloride Test Solution (0.16 N.)—Dissolve 2 Gm. of cobaltous chloride in 1 cc. of hydrochloric acid and sufficient distilled water to make 100 cc.

Cobalt-Uranyl Acetate Test Solution—*Solution I*—Add 40 Gm. of uranyl acetate to 30 Gm. of glacial acetic acid and add sufficient distilled water to make the solution measure 500 cc. *Solution II*—Add 200 Gm. of cobalt acetate to 30 Gm. of glacial acetic acid and sufficient distilled water to make the solution measure 500 cc.

Heat the separate solutions at a temperature of about 75° C. until the salts have dissolved, then mix the two solutions and cool to 20° C. Maintain the temperature at this point for about 2 hours to separate the excess salts from solution and then filter through a dry filter.

Cupric Acetate Test Solution—Dissolve 0.1 Gm. of cupric acetate in about 5 cc. of distilled water to which a few drops of acetic acid have been added. Dilute to 100 cc. and filter if necessary.

Cupric Acetate Test Solution, Stronger (*Barfoed's Reagent*)—Dissolve 13.3 Gm. of cupric acetate in a mixture of 195 cc. of distilled water and 5 cc. of acetic acid.

Cupric-Ammonium Sulfate Test Solution—To cupric sulfate T.S. add ammonia T.S., drop by drop, until the precipitate at first formed is nearly but not completely dissolved. Allow to settle and decant the clear solution. This solution must be freshly prepared.

Cupric Oxide, Ammoniated, Test Solution (*Schweitzer's Reagent*)—Dissolve 10 Gm. of cupric sulfate in 100 cc. of distilled water, add sufficient 20 per cent sodium hydroxide solution to precipitate the copper hydroxide, collect the latter on a filter, and wash free from sulfate with cold distilled water. Dissolve the precipitate, which must be kept wet during the entire process, in the minimum quantity of ammonia T.S. necessary for complete solution.

Cupric Sulfate Test Solution (1 N.)—Dissolve 12.5 Gm. of cupric sulfate in sufficient distilled water to make 100 cc.

Delafield's Hematoxylin Test Solution—*Solution A*—Prepare 400 cc. of a saturated aqueous solution of ammonium alum. *Solution B*—Dissolve 4 Gm. of hematoxylin in 25 cc. of alcohol, mix it with Solution A, allow it to stand for 4 days, in a

flask closed with a pledget of purified cotton, and exposed to light and air. Then filter and add to it Solution C, consisting of a mixture of 100 cc. of glycerin and 100 cc. of methanol. Mix thoroughly and allow the mixture to stand in a warm place, exposed to light, for 6 weeks until it becomes dark colored. Keep the solution in a tightly stoppered bottle.

Denigès' Reagent—Use *Mercuric Sulfate T.S.*, page 739.

Diazobenzene-Sulfonic Acid Test Solution—Dry about 2 Gm. of sulfanilic acid for 3 hours at 110° C. Weigh 1.57 Gm. of the dried acid, place it in a beaker, add 80 cc. of distilled water and 10 cc. of diluted hydrochloric acid, and warm on a steam bath until dissolved. Cool to 15° C. (some of the sulfanilic acid may separate but will be dissolved later) and add slowly, and with constant stirring, 6.5 cc. of a 10 per cent aqueous solution of sodium nitrite; then dilute with distilled water to 100 cc.

Diazotized *p*-Aminoacetophenone Test Solution—(a) Dissolve 1.27 Gm. of *p*-aminoacetophenone in 18 cc. of hydrochloric acid and add sufficient distilled water to make 200 cc., and mix well. Store the solution in amber bottles and protect from direct sunlight.

(b) Dissolve 9.0 Gm. of sodium nitrite in sufficient distilled water to make 200 cc., and mix well. When not in use keep the solution in a refrigerator.

(c) Dissolve 4 Gm. of sodium hydroxide in 150 cc. of distilled water, add 5.76 Gm. of sodium bicarbonate, then add sufficient distilled water to make 200 cc., and mix well.

(d) Place a suitable volume of (a) in a beaker surrounded with ice and provided with a stirrer. Add an equal volume of (b) and stir the mixture for 10 minutes. At the end of this period add 4 volumes of (b) and stir for 30 minutes maintaining the mixture at a temperature not above 5° C. This solution should be used within 2 days of its preparation, and when not in use it should be kept in a refrigerator.

The test solution is made by adding 10 cc. of (d) to 137 cc. of (c) and stirring until the purple color first produced disappears. This will usually take place in 5 to 10 minutes. Prepare the test solution immediately before use.

Diiodofluorescein Test Solution—Dissolve 0.5 Gm. of diiodofluorescein in a mixture of 75 cc. of alcohol and 30 cc. of distilled water.

Dimethylamino-Benzaldehyde Test Solution—Dissolve 0.125 Gm. of *p*-dimethylaminobenzaldehyde in a cooled mixture of 65 cc. of sulfuric acid and 35 cc. of distilled water, and add 0.05 cc. of ferric chloride T.S. This solution must not be used if it has been prepared longer than 7 days.

Dinitrophenylhydrazine Test Solution—Dissolve 1.5 Gm. of dinitrophenylhydrazine in a cooled mixture of 10 cc. of sulfuric acid and 10 cc. of distilled water. Add enough of a mixture of 1 volume of aldehyde-free alcohol and 3 volumes of distilled water to make the volume of the solution 100 cc., and filter if necessary.

Diphenylamine Test Solution—Dissolve 1.0 Gm. of diphenylamine in 100 cc. of sulfuric acid. The solution should be colorless.

Fehling's Solution—Use *Alkaline Cupric Tartrate T.S.*, page 732.

Ferric-Ammonium Sulfate Test Solution (0.5 N.)—Dissolve 8 Gm. of reagent ferric-ammonium sulfate in sufficient distilled water to make 100 cc.

Ferric Chloride Test Solution (1 N.)—Dissolve 9 Gm. of ferric chloride in sufficient distilled water to make 100 cc.

Ferrous Sulfate Test Solution—Dissolve 8 Gm. of clear crystals of ferrous sulfate in about 100 cc. of recently boiled and thoroughly cooled distilled water. This solution must be freshly prepared.

Ferrous Sulfate Test Solution, Acid (0.25 N.)—Dissolve 7 Gm. of ferrous sulfate crystals in 90 cc. of recently boiled and thoroughly cooled distilled water and add sufficient sulfuric acid to make 100 cc. This solution must not be kept for long periods of time.

Formaldehyde Test Solution—Use *Liquor Formaldehydi*, page 267.

Fuchsin-Sulfurous Acid Test Solution—Dissolve 0.2 Gm. of basic fuchsin in 120 cc. of hot distilled water and allow the solution to cool. Add a solution of 2 Gm. of anhydrous sodium sulfite in 20 cc. of distilled water and follow by 2 cc. of hydrochloric acid. Dilute the solution with distilled water to 200 cc. and allow to stand at least 1 hour. This solution must be freshly prepared.

Gelatin Test Solution—Dissolve 1 Gm. of gelatin in 50 cc. of distilled water with the aid of gentle heat, and filter, if necessary. This test solution must be freshly prepared.

Gold Chloride Test Solution (0.2 N.)—Dissolve 1 Gm. of reagent gold chloride in 35 cc. of distilled water.

Hydrogen Peroxide Test Solution—Use *Liquor Hydrogenii Peroxidi*, page 268.

Hydrogen Sulfide Test Solution—A saturated aqueous solution of hydrogen sulfide, made by passing H_2S into cold distilled water. Keep the solution in small, dark amber-colored bottles, filled nearly to the top. Do not use it unless it possesses a strong odor of H_2S , and unless it produces at once a copious precipitate of sulfur when added to an equal volume of ferric chloride T.S. Preserve in a cool, dark place.

Hydroxylamine Hydrochloride Test Solution—Dissolve 3.5 Gm. of hydroxylamine hydrochloride in 95 cc. of 60 per cent alcohol, add 0.5 cc. of a 0.1 per cent solution of bromophenol blue and half-normal alcoholic potassium hydroxide until a greenish tint develops in the solution. Then add sufficient 60 per cent alcohol to make the solution measure 100 cc.

Hypophosphorous Acid Test Solution—Use *Acidum Hypophosphorosum*, page 22.

Indigo Carmine Test Solution—Dissolve a quantity of indigo carmine, equivalent to 0.18 Gm. of $C_{16}H_8N_2O_2(SO_3Na)_2$, in sufficient distilled water to make 100 cc. This solution should not be used after 60 days from the time of its preparation.

Iodine and Potassium Iodide Test Solution—Dissolve 0.5 Gm. of iodine and 1.5 Gm. of potassium iodide in 25 cc. of distilled water.

Iodine Test Solution—Use *tenth-normal iodine*, page 752.

Iodobromide Test Solution—Dissolve 13.2 Gm. of reagent iodine in 1000 cc. of glacial acetic acid with the aid of gentle heat if necessary. Cool the solution to 25° C. and determine the iodine content in 20 cc. by titration with tenth-normal sodium thiosulfate. Add to the remainder of the solution a quantity of bromine equivalent to that of the iodine present. Preserve in glass-stoppered bottles, protected from light.

Lead Acetate Test Paper—Immerse strips of heavy white filter paper, 6 mm. in width and 8 cm. in length, in lead acetate T.S.; drain off the excess liquid and dry the paper on glass in an oven at 100° C., avoiding contact with metal.

Lead Acetate Test Solution (0.5 N.)—Dissolve 9.5 Gm. of clear, transparent crystals of lead acetate, in sufficient recently boiled distilled water to make 100 cc. Preserve in well-stoppered bottles.

Lead Acetate Test Solution, Alcoholic (0.1 N.)—Dissolve 2 Gm. of clear, transparent crystals of lead acetate in sufficient alcohol to measure 100 cc. Preserve in well-stoppered bottles.

Lead Subacetate Test Solution—Triturate 14 Gm. of lead monoxide to a smooth paste with 10 cc. of distilled water, transfer the mixture to a bottle, using an additional 10 cc. of distilled water for rinsing. Dissolve 22 Gm. of lead acetate in 70 cc. of distilled water and add the solution to the lead oxide mixture. Shake it vigorously for 5 minutes, then set it aside, shaking it frequently, during 7 days. Finally, filter and add enough recently boiled distilled water through the filter to make the product measure 100 cc.

Lead Subacetate Test Solution, Diluted—Dilute 4 Gm. of lead subacetate T.S. with sufficient distilled water, recently boiled and cooled, to make the product weigh 100 Gm. Preserve in small, well-filled, and tightly-stoppered bottles.

Litmus Test Solution—Digest 25 Gm. of powdered litmus with three successive portions of 100 cc. each of boiling alcohol, continuing each extraction for about one hour. Filter, wash with alcohol, and discard the alcoholic filtrate. Macerate the residue with about 25 cc. of cold distilled water for 4 hours and filter. Discard this filtrate also. Finally digest the residue with 125 cc. of boiling distilled water for 1 hour and, after thoroughly cooling, filter. Litmus turns red with acids and blue with alkalies. The pH range is from red, 4.5 to 8.3, blue. Litmus is unsuitable for determining alkaloids, carbonates, or bicarbonates. Preserve the filtrate in wide-mouthed bottles, stoppered with loose plugs of purified cotton.

Locke-Ringer's Solution—

Reagent Sodium Chloride.....	9	Gm.
Reagent Potassium Chloride.....	0.42	Gm.
Reagent Calcium Chloride.....	0.24	Gm.
Reagent Magnesium Chloride.....	0.2	Gm.
Sodium Bicarbonate.....	0.5	Gm.
Dextrose.....	0.5	Gm.

Water, recently distilled from a hard glass flask, a sufficient quantity,

To make..... 1000 cc.

The solution must be freshly made each day. The constituents (except the dextrose and the sodium bicarbonate) may be made up in a more concentrated stock solution and diluted as needed.

Magnesia Mixture Test Solution—Dissolve 5.5 Gm. of magnesium chloride and 7 Gm. of reagent ammonium chloride in 65 cc. of distilled water, add 35 cc. of ammonia T.S., set the mixture aside for a few days in a well-stoppered bottle, and filter. If the solution is not perfectly clear, filter it before using.

Magnesium Sulfate Test Solution (1 N.)—Dissolve 12 Gm. of uneffloresced crystals of magnesium sulfate in sufficient distilled water to make 100 cc.

Mallory's Stain—Dissolve 0.5 Gm. of water-soluble aniline blue, 2 Gm. of orange G, and 2 Gm. of oxalic acid in 100 cc. of distilled water.

Manganese Sulfate Test Solution (1 N.)—Dissolve 11 Gm. of manganese sulfate in 50 cc. of distilled water and add sufficient diluted sulfuric acid to make 100 cc.

Mayer's Reagent—See *Mercuric-Potassium Iodide T.S.*

Mercuric Bromide Test Paper—Cut stiff, heavy quantitative filter paper (see Filter Paper, Quantitative, page 675) into strips 2.5 mm. in width and about 12 cm. in length. Immerse these strips for 1 hour in alcoholic mercuric bromide T.S. Remove from solution without touching that portion of the strip which is to be used to form the stain. Allow the alcohol to evaporate spontaneously while the strips are suspended from glass rods. Place them at once in a glass-stoppered, wide-mouthed bottle, and protect from light.

Mercuric Bromide Test Solution, Alcoholic (0.3 N.)—Dissolve 5 Gm. of mercuric bromide in 100 cc. of alcohol, employing gentle heat to facilitate solution. Preserve in glass-stoppered bottles, and protect from light.

Mercuric Iodide Test Solution (*Valser's Reagent*)—Slowly add a 10 per cent solution of potassium iodide to red mercuric iodide until almost all of the red mercuric iodide is dissolved. Remove the excess mercuric iodide by filtration. A solution containing 10 Gm. of potassium iodide in 100 cc. dissolves approximately 14 Gm. of HgI_2 at 20° C.

Mercuric Nitrate Test Solution (4 N.)—Dissolve 40 Gm. of red mercuric oxide in a mixture of 32 cc. of nitric acid and 15 cc. of distilled water. Preserve in glass-stoppered bottles, protected from light.

Mercuric-Potassium Iodide Test Solution (*Mayer's Reagent*)—Dissolve 1.358 Gm. of mercuric chloride in 60 cc. of distilled water. Dissolve 5 Gm. of potassium iodide in 10 cc. of distilled water. Mix the two solutions and add sufficient distilled water to make 100 cc.

Mercuric-Potassium Iodide Test Solution, Alkaline (*Nessler's Reagent*)—Dissolve 10 Gm. of potassium iodide in 10 cc. of distilled water, and add slowly, with stirring, a saturated aqueous solution of mercury bichloride until a slight red precipitate remains undissolved. To this mixture add 30 Gm. of potassium hydroxide. After solution has taken place, add 1 cc. more of the saturated aqueous solution of

mercury bichloride. Dilute with distilled water to 200 cc. Allow the precipitate to settle and draw off the clear liquid. A 2-cc. portion of this reagent, when added to 50 cc. of distilled water containing 0.05 mg. of ammonia, produces at once a yellowish brown coloration.

Mercuric Sulfate Test Solution (*Denigès' Reagent*)—Mix 5 Gm. of yellow mercuric oxide with 40 cc. of distilled water and while stirring slowly add 20 cc. of sulfuric acid, then add another 40 cc. of distilled water and stir until completely dissolved.

Mercurous Nitrate Test Solution (0.5 N.)—Dissolve 15 Gm. of mercurous nitrate in a mixture of 90 cc. of distilled water and 10 cc. of diluted nitric acid. Preserve in a dark, amber-colored bottle in which a small globule of mercury has been placed.

Mercury Bichloride Test Solution (0.5 N.)—Dissolve 6.5 Gm. of mercury bichloride in sufficient distilled water to make 100 cc.

Metaphenylenediamine Hydrochloride Test Solution—Dissolve 1 Gm. of metaphenylenediamine hydrochloride in 200 cc. of distilled water: the solution must be colorless when used. If necessary, decolorize by heating with decolorizing charcoal.

Methylthionine Perchlorate Test Solution—To 500 cc. of a solution of potassium perchlorate (1 in 1000) add, drop by drop, with constant shaking, a solution of methylthionine chloride (1 in 100) until a slight permanent turbidity results. Allow the precipitate to settle and filter the supernatant liquid through paper.

Naphthylamine Acetate Test Solution—Dissolve 0.5 Gm. of β -naphthylamine acetate in 100 cc. of acetic acid and filter quickly through purified cotton. Preserve in well-stoppered bottles, protected from light.

Nessler's Reagent—See *Mercuric Potassium Iodide T.S., Alkaline*, page 738.

Ortho-Phenanthroline Test Solution—Dissolve 0.15 Gm. of ortho-phenanthroline in 10 cc. of a solution of ferrous sulfate, prepared by dissolving 1.48 Gm. of clear crystals of ferrous sulfate in 100 cc. of distilled water. The ferrous sulfate solution must be prepared immediately before dissolving the ortho-phenanthroline. Preserve the solution in well-closed containers.

Oxalic Acid Test Solution (1 N.)—Dissolve 6.3 Gm. of oxalic acid in sufficient distilled water to measure 100 cc.

Palladous Chloride Test Solution—Dissolve 0.5 Gm. of palladous chloride in sufficient distilled water to measure 10 cc. Preserve in glass-stoppered bottles.

Phenoldisulfonic Acid Test Solution—Dissolve 2.5 Gm. of phenol in 15 cc. of sulfuric acid in a flask of suitable capacity. Add 7.5 cc. of fuming sulfuric acid, stir well, and heat for 2 hours at 100° C. Transfer the product, while still fluid, to a glass-stoppered bottle, and, when desired for use, warm in a water bath until liquefied.

Phenylhydrazine Acetate Test Solution—Dissolve 10 cc. of phenylhydrazine and 5 cc. of glacial acetic acid in sufficient distilled water to make 100 cc.

Phloroglucinol Test Solution—Dissolve 0.5 Gm. of phloroglucinol in 25 cc. of alcohol. Preserve in a tightly stoppered bottle, protected from light.

Phosphotungstic Acid Test Solution—Dissolve 1 Gm. of phosphotungstic acid in sufficient distilled water to make 100 cc.

Picric Acid Test Solution—Use *Trinitrophenol Test Solution*, page 743.

Platinic Chloride Test Solution (0.5 N.)—Dissolve 2.6 Gm. of platinic chloride in sufficient distilled water to make 20 cc.

Potassium Acetate Test Solution (1 N.)—Dissolve 10 Gm. of potassium acetate in sufficient distilled water to make 100 cc.

Potassium Carbonate Test Solution (1 N.)—Dissolve 7 Gm. of reagent anhydrous potassium carbonate in sufficient distilled water to make 100 cc.

Potassium Chromate Test Solution (1 N.)—Dissolve 10 Gm. of potassium chromate in sufficient distilled water to make 100 cc.

Potassium Dichromate Test Solution (1 N.)—(Based on the basicity of CrO_3)—Dissolve 7.5 Gm. of potassium dichromate in sufficient distilled water to make 100 cc.

Potassium Ferricyanide Test Solution (1 N.)—Dissolve 1 Gm. of potassium ferricyanide in 10 cc. of distilled water. This test solution must be freshly prepared.

Potassium Ferrocyanide Test Solution (1 N.)—Dissolve 1 Gm. of potassium ferrocyanide in 10 cc. of distilled water. The solution must be freshly prepared.

Potassium Hydroxide Test Solution (1 N.)—Dissolve 6.5 Gm. of potassium hydroxide in sufficient distilled water to make 100 cc.

Potassium Hydroxide Test Solution, Alcoholic—Use *half-normal alcoholic potassium hydroxide*, page 755.

Potassium Iodide Test Solution (1 N.)—Dissolve 16.5 Gm. of potassium iodide in sufficient distilled water to make 100 cc. Preserve in amber-colored bottles.

Potassium Permanganate Test Solution—Use *tenth-normal potassium permanganate*, page 756.

Potassium Sulfate Test Solution—Dissolve 1 Gm. of potassium sulfate in sufficient distilled water to make 100 cc.

Pyrogallol Test Solution, Alkaline—Dissolve 0.5 Gm. of pyrogallol in 2 cc. of distilled water. Dissolve 12 Gm. of potassium hydroxide in 8 cc. of distilled water. The solutions should be freshly prepared and mixed immediately before using.

Resorcinol Test Solution—Dissolve 1 Gm. of resorcinol in sufficient reagent hydrochloric acid to make 100 cc.

Schweitzer's Reagent—Use *Ammoniated Cupric Oxide T.S.*, page 734.

Silver Ammonium Nitrate Test Solution—Dissolve 1 Gm. of silver nitrate in 20 cc. of distilled water. Add ammonia T.S., drop by drop, with constant stirring, until the precipitate is almost but not entirely dissolved. Filter and preserve the solution in dark amber-colored, well-stoppered bottles.

Silver Nitrate Test Solution—Use *tenth-normal silver nitrate*, page 757.

Silver Sulfate Test Solution—Add 1 Gm. of silver sulfate to 100 cc. of distilled water in a glass-stoppered bottle, shake thoroughly and allow to stand over night. Decant the clear solution when required for use.

Sodium Acetate Test Solution (1 N.)—Dissolve 13.6 Gm. of sodium acetate in sufficient distilled water to make 100 cc.

Sodium Alizarinsulfonate Test Solution—Dissolve 0.1 Gm. of sodium alizarin-sulfonate in 100 cc. of distilled water and filter.

Sodium Bisulfite Test Solution—Dissolve 10 Gm. of sodium bisulfite in sufficient distilled water to make 30 cc. The solution must be freshly prepared.

Sodium Bitartrate Test Solution (1 N.)—Dissolve 1 Gm. of sodium bitartrate in sufficient distilled water to make 10 cc. This test solution must be freshly prepared.

Sodium Carbonate Test Solution (2 N.)—Dissolve 12.5 Gm. of monohydrated sodium carbonate in sufficient distilled water to make 100 cc.

Sodium Cobaltinitrite Test Solution—Dissolve 4 Gm. of cobaltous chloride and 10 Gm. of sodium nitrite in about 50 cc. of distilled water, add 2 cc. of acetic acid, and dilute with sufficient distilled water to make 100 cc. This reagent must not be kept longer than 3 months. It may be preserved for this length of time by the occasional addition of a few drops of acetic acid.

Sodium Fluoride Test Solution—Dry about 0.5 Gm. of reagent sodium fluoride at 200° C. for 4 hours. Weigh accurately 0.222 Gm. of the dried sodium fluoride and dissolve it in sufficient distilled water to make exactly 100 cc. Dilute exactly 10 cc. of the solution with distilled water to make 1000 cc. Each cc. of this solution corresponds to 0.01 mg. of fluorine.

Sodium Hydrosulfite Test Solution, Alkaline—Dissolve 50 Gm. of potassium hydroxide in 70 cc. of distilled water, and 50 Gm. of sodium hydrosulfite in 250 cc. of distilled water. When the test solution is required mix 40 cc. of the hydroxide solution with the 250 cc. of the hydrosulfite solution. The sodium hydrosulfite solution should be freshly prepared.

Sodium Hydroxide Test Solution (1 N.)—Dissolve 4.3 Gm. of sodium hydroxide in sufficient distilled water to make 100 cc.

Sodium Hypobromite Test Solution—To a solution of 20 Gm. of sodium hydroxide in 75 cc. of distilled water add 5 cc. of bromine. After solution has taken place, add sufficient distilled water to make 100 cc. It must be freshly prepared.

Sodium Hypochlorite Test Solution—Triturate 100 Gm. of chlorinated lime with 500 cc. of distilled water gradually added until a uniform mixture results. Dissolve 70 Gm. of monohydrated sodium carbonate in 500 cc. of warm distilled water, and add this solution, with constant stirring, to the suspension of chlorinated lime. Transfer the mixture to a wetted muslin filter and return the first portion of filtrate until the filtrate becomes clear. Add a few drops of sodium carbonate T.S. to 10 cc. of

the clear filtrate: if the liquid becomes turbid return the filtrate and precipitate to the precipitation vessel, add sufficient monohydrated sodium carbonate to precipitate the excess of lime, and refilter. Finally wash the drained precipitate with sufficient distilled water to make the filtrate and washings weigh 1000 Gm.

Liquor Sodii Hypochloritis, page 276, may be substituted for the above, except in the assay of *Thyroideum*.

Sodium Nitroprusside Test Solution—Dissolve 1 Gm. of sodium nitroprusside in sufficient distilled water to make 20 cc. It must be freshly prepared.

Sodium Phosphate Test Solution (1 N.)—Dissolve 12 Gm. of clear crystals of sodium phosphate in sufficient distilled water to make 100 cc.

Sodium Phosphotungstate Test Solution—To a solution of 20 Gm. of sodium tungstate in 100 cc. of distilled water, add sufficient phosphoric acid to impart a strongly acid reaction to litmus paper, and filter. When required for use, decant the clear solution from any sediment that may be present. Preserve the solution in amber-colored, glass-stoppered bottles.

Sodium Sulfide Test Solution (1 N.)—Dissolve 1 Gm. of sodium sulfide in sufficient distilled water to make 10 cc. This test solution must be freshly prepared.

Sodium Tartrate Test Solution (1 N.)—Dissolve 11.5 Gm. of sodium tartrate in sufficient distilled water to make 100 cc.

Sodium Thiosulfate Test Solution—Use *tenth-normal sodium thiosulfate*, page 761.

Standard Lead Solution—See page 586.

Stannous Chloride Test Solution—Dissolve 1.5 Gm. of stannous chloride in 10 cc. of distilled water containing a small amount of hydrochloric acid. Preserve the solution in a glass-stoppered bottle in which a fragment of reagent tin has been placed. The solution must be freshly prepared at frequent intervals.

Stannous Chloride Test Solution, Acid—Dissolve 8 Gm. of stannous chloride in 500 cc. of reagent hydrochloric acid. This solution should be used within 3 months after the time of its preparation. Preserve in a glass-stoppered bottle.

Starch Iodide Paste Test Solution—Heat 100 cc. of distilled water in a 250-cc. beaker to boiling, add a solution of 0.75 Gm. of potassium iodide in 5 cc. of distilled water, then follow with 2 Gm. of zinc chloride dissolved in 10 cc. of distilled water. While the solution is boiling add, with stirring, a smooth suspension of 5 Gm. of potato starch in 30 cc. of cold distilled water, and continue to boil for 2 minutes, then cool. Preserve Starch Iodide Paste T.S. in well-closed containers in a cold place.

Starch Iodide Paste T.S. must show a definite blue streak when a glass rod, dipped in a mixture of 1 cc. of tenth-molar sodium nitrite, 500 cc. of distilled water, and 10 cc. of hydrochloric acid, is streaked on a smear of the paste.

Starch-Potassium Iodide Test Solution—Dissolve 0.5 Gm. of potassium iodide in 100 cc. of freshly prepared starch T.S. This solution should not be used if it is more than 24 hours old.

Starch Test Solution—Triturate 1 Gm. of arrowroot starch with 10 cc. of cold

distilled water and pour slowly with constant stirring into 200 cc. of boiling distilled water. Boil the mixture until a thin, translucent fluid is obtained. Allow to settle and use only the clear, supernatant liquid. Longer boiling than necessary renders the test solution less sensitive. The test solution must be freshly prepared.

Sulfanilic Acid Test Solution—Dissolve 0.8 Gm. of sulfanilic acid in 100 cc. of a 30 per cent solution of acetic acid. Preserve in well-stoppered bottles.

Sulfanilic- α -Naphthylamine Test Solution—Dissolve 0.5 Gm. of sulfanilic acid in 150 cc. of acetic acid. Dissolve 0.1 Gm. of α -naphthylamine hydrochloride in 150 cc. of acetic acid and mix the two solutions. The pink color which may develop on standing can be removed by treatment with zinc dust.

Sulfuric Acid Test Solution—Use *Acidum Sulfuricum Dilutum*, page 31.

Sulfuric Acid-Formaldehyde Test Solution—Add 1 drop of formaldehyde T.S. to each cc. of sulfuric acid and mix. This test solution should be freshly prepared.

Sulfurous Acid Test Solution—Use *Sulfurous Acid*, page 728.

Tannic Acid Test Solution—Dissolve 1 Gm. of tannic acid in 1 cc. of alcohol and add sufficient distilled water to measure 10 cc. This solution should be freshly prepared.

Tartaric Acid Test Solution (4 N.)—Dissolve 3 Gm. of tartaric acid in sufficient distilled water to measure 10 cc. This solution should be freshly prepared.

Trinitrophenol Test Solution (*Picric Acid Test Solution*)—Dissolve the equivalent of 1 Gm. of anhydrous trinitrophenol in 100 cc. of hot distilled water. Cool the solution and filter, if necessary.

Turmeric Test Solution—Macerate 20 Gm. of powdered turmeric, the dried root of *Curcuma longa* Linné (Fam. *Zingiberaceæ*), with 4 successive portions of 100 cc. each of cold distilled water, decanting the clear liquid portion each time and discarding it. Dry the residue at a temperature not over 100° C. Macerate with 100 cc. of alcohol for several days and filter.

Colorimetric Solutions (C.S.)

These solutions are used in the preparation of the colorimetric standards for certain drugs, and the carbonization tests with sulfuric acid which are applied to a number of organic compounds in the Pharmacopœia. These solutions must be accurately standardized as described under the various titles, and must be stored in glass-stoppered bottles made of insoluble glass.

When colors of pharmacopœial substances or pharmacopœial test mixtures are to be compared with color standards, the several containers shall be of clear, colorless glass and must be alike in cross section. The comparison of colors must be made in layers of equal thickness, and viewed transversely against a white background.

Preparation of the Permanent Color Standards

Cobaltous Chloride Colorimetric Solution—Dissolve about 65 Gm. of cobaltous chloride, $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$, in enough of a mixture of 25 cc. of hydrochloric acid and

975 cc. of distilled water to make 1000 cc. Place exactly 5 cc. of this solution in a 250-cc., glass-stoppered flask, add 5 cc. of solution of hydrogen dioxide and 15 cc. of sodium hydroxide (1 to 5), boil for 10 minutes, cool, and add 2 Gm. of potassium iodide and 20 cc. of sulfuric acid (1 to 4). When the precipitate has dissolved, titrate the liberated iodine with tenth-normal sodium thiosulfate. Each cc. of tenth-normal sodium thiosulfate consumed is equivalent to 0.02380 Gm. of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$. Adjust the final volume of the solution by the addition of enough of the mixture of hydrochloric acid and water to make each cc. contain 0.05950 Gm. of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$.

Ferric Chloride Colorimetric Solution—Dissolve about 55 Gm. of reagent ferric chloride in enough of a mixture of 25 cc. of hydrochloric acid and 975 cc. of distilled water to make 1000 cc. Measure exactly 10 cc. of the solution into a glass-stoppered flask, add 15 cc. of distilled water, and proceed as directed in the *assay of Ferri et Ammonii Citrates*, page 183, beginning with "add 5 cc. of hydrochloric acid." Each cc. of tenth-normal sodium thiosulfate is equivalent to 0.02703 Gm. of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$. Adjust the final volume of the solution by the addition of enough of the mixture of hydrochloric acid and water to make each cc. contain 0.04505 Gm. of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$.

Cupric Sulfate Colorimetric Solution—Dissolve about 65 Gm. of reagent cupric sulfate in enough of a mixture of 25 cc. of hydrochloric acid and 975 cc. of distilled water to make 1000 cc. of solution. Assay exactly 10 cc. of this solution as directed under *Cupri Sulfas*, page 146, and adjust the final volume of the solution by the addition of enough of the mixture of hydrochloric acid and water to make each cc. contain 0.06243 Gm. of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

Volumetric Apparatus

It is essential that all measuring vessels, burettes, flasks, pipettes, etc., shall be accurately calibrated at the standard temperature of 25° C. or at such other temperature as seems best for the particular locality in which the apparatus is to be used. All volumetric solutions, if practicable, shall be prepared, standardized, and used at this standard temperature. If a titration is carried out at a markedly different temperature, the volumetric solution should be standardized at that same temperature or a suitable temperature correction made. Apparatus calibrated at other temperatures (15°–25° C.) may be used, provided the volumetric solutions are standardized and used at this same temperature or necessary temperature corrections made.

Units of Capacity—The units of volume employed by this Pharmacopœia must be in accord with its standard liter at 25° C., which represents the volume occupied by 996.04 Gm. of distilled water, weighed in air with brass weights, at a temperature of 25° C. To secure uniformity among the various forms of apparatus employed, the standard specifications of the U. S. Bureau of Standards should be adhered to as closely as possible, except that the temperature adopted is 25° C. Data relative to the calibration of graduated glass apparatus will be found on page 812.

Measuring Flasks—Standard measuring flasks are calibrated to contain, when filled to the mark, 1000, 500, 250, 200, 100, or 50 cc. at 25° C. The necks must measure not less than 14 mm. and not more than 20 mm. in diameter for 1000-cc. capacity; from 12 mm. to 18 mm. for 500-cc. capacity; from 10 mm. to 15 mm. for 250-cc. capacity; from 8 mm. to 12 mm. for 100-cc. capacity, and from 6 mm. to 10 mm. for 50-cc. capacity. The capacity mark on any of these flasks should be

not less than 6 cm. distant from the mouth and not less than 2 cm. from the base of the neck. The limits of error permitted in the calibration of flasks shall be those accepted by the United States Bureau of Standards, which are as follows:

Contents of flask	50 cc.	100 cc.	250 cc.	500 cc.	1000 cc.
Limit of error in cc.	0.05	0.08	0.12	0.15	0.30
Limit of error in per cent	0.10	0.08	0.05	0.03	0.03

Cylinders—Cylinders should be graduated to contain their respective volumes at the standard temperature. Their inside diameter must not be more than one-fifth of the graduated length.

Transfer Pipettes—Pipettes should be graduated to deliver at standard temperature the volume indicated. The suction stem should be at least 16 cm. long, and the delivery tube not less than 3 cm. and not more than 25 cm. long. The inside diameter at the capacity mark must not be less than 2 mm. It must not exceed 4 mm. for pipettes up to and including 25-cc. capacity, 5 mm. for 50-cc. capacity, and 6 mm. for 100-cc. and 200-cc. capacities. The capacity mark must not be more than 6 cm. from the bulb. The outlet of any transfer pipette must be of such size that the free outflow for water shall last not more than 1 minute. Not less than 15 seconds shall be required to empty a 5-cc. pipette, 20 seconds for a 10-cc. pipette, 30 seconds for a 50-cc. pipette, 40 seconds for a 100-cc. pipette, and a minimum of 50 seconds for a 200-cc. pipette. After filling, the liquid adhering to the outside should be wiped from the stem. When emptying the contents, the pipette should be held in a vertical position and the outflow should be unrestricted until the surface of the liquid reaches the upper end of the delivery tube; the tip should then be touched to the wet surface of the receiving vessel and kept in contact with it until the emptying is complete. Pipettes should never be drained by blowing into them unless, as in the case of the Ostwald pipettes, they are especially graduated for use in this way.

The limits of error permitted in the calibration of pipettes shall be those accepted by the United States Bureau of Standards, which are as follows:

Contents of pipettes	2 cc.	5 cc.	10 cc.	25 cc.	50 cc.	100 cc.
Limit of error in cc.	0.006	0.01	0.02	0.03	0.05	0.08
Limit of error in per cent	0.30	0.20	0.20	0.12	0.10	0.08

It is essential that in using pipettes the same procedure be employed as was used in the calibration.

Burettes—All burettes should be provided with glass stopcocks and calibrated for use at the standard or other temperature at which they are to be used. Burettes provided with rubber tubes, pinch-cocks, and glass delivery tubes in place of glass stopcocks may be used for potassium and sodium hydroxide solutions and such other solutions as are best used in this type of burette. The glass tips should be from 2 to 3 cm. in length, gradually tapered and straight or slightly bent. The rate of outflow should be regulated so that not less than 2 seconds should be consumed for each cc. delivered. When completing a titration, the tip of the delivery tube should be touched to the wet inner surface of the receiving vessel and the solution again stirred.

General Directions—All bottles in which volumetric solutions are to be kept, as well as the burettes or pipettes in which they are to be measured, should be thor-

oroughly cleaned prior to use, then rinsed with distilled water, and afterward with 2 or 3 small portions of the solution that they are to contain. Readings should always be made from the lowest point of a meniscus unless the liquid is too opaque to permit exact observation of that point. It is of the utmost importance that the inner surface of all measuring apparatus shall be free from dirt or grease.

Indicators for Volumetric Determinations

Indicator test solutions are likely to be injured by exposure to light, therefore they must be kept protected from the light, in amber colored, stoppered bottles.

Unless otherwise stated, each indicator solution should be so adjusted that when 0.15 cc. of the indicator solution is added to 25 cc. of distilled water, 0.25 cc. of fiftieth-normal acid or alkali, respectively, will develop the characteristic color changes.

Bromophenol Blue (*Tetrabromophenolsulfonphthalein*)—Pinkish crystals, soluble in alcohol, insoluble in water, soluble in solution of alkali hydroxide. Transition interval: from 3.0 to 4.6 pH. Color change from yellow to bluish violet.

Bromophenol Blue Test Solution—Dissolve 0.10 Gm. of bromophenol blue in 100 cc. of 50 per cent alcohol, and filter if necessary.

Bromothymol Blue (*Dibromothymolsulfonphthalein*)—Rose red powder, soluble in alcohol, insoluble in water, soluble in solution of alkali hydroxide. Transition interval: from 6.0 to 7.6 pH. Color change from yellow to blue.

Bromothymol Blue Test Solution—Dissolve 0.10 Gm. of bromothymol blue in 100 cc. of 50 per cent alcohol, and filter if necessary.

Methyl Orange (*Helianthin* or *Tropæolin D*)—The sodium salt of dimethylaminoazobenzene sulfonic acid or dimethylaminoazobenzene sodium sulfonate. An orange yellow powder or crystalline scales; slightly soluble in cold water, insoluble in alcohol. It is readily soluble in hot water. Transition interval: from 3.1 to 4.4 pH. Color change from pink to yellow.

Methyl Orange Test Solution—Dissolve 0.10 Gm. of methyl orange in 100 cc. of distilled water, and filter if necessary.

Methyl Red (*Dimethylaminoazobenzene-o-carboxylic acid*; *o-carboxy benzene-azodimethyl aniline*)—A dark red powder or violet crystals. Sparingly soluble in water, soluble in alcohol. Transition interval: from 4.2 to 6.3 pH. Color change from red to yellow.

Methyl Red Test Solution—Dissolve 0.10 Gm. of methyl red in 100 cc. of alcohol and filter the solution if necessary. This indicator is especially useful in titrating ammonia, weak bases, and alkaloids, but is unsuited for the titration of weak organic acids.

Phenolphthalein—Use *Phenolphthaleinum*, page 359.

Phenolphthalein Test Solution—Dissolve 1 Gm. of phenolphthalein in 100 cc. of alcohol. This indicator is especially well suited for the titration of weak acids. It

functions well in alcoholic solution. It is unsatisfactory for use with alkaloids, ammonia, carbonates, and bicarbonates. Transition interval: from 8.0 to 9.8 pH. Color changes from colorless to red. .

Indicator Papers

Strong, white filter paper is treated with hydrochloric acid and washed with distilled water until the washings no longer show an acid reaction to methyl red. It is then treated with ammonia T.S. and again washed with distilled water until the washings are no longer alkaline toward phenolphthalein. It is then thoroughly dried.

The dry paper is then saturated with the proper strength indicator solution and carefully dried. The drying is accomplished by suspending the paper in a room free from acid or alkali fumes.

The papers so prepared are kept in glass-stoppered bottles, carefully protected from light and moisture.

Litmus Paper, Blue—Usually in the form of strips about 50 mm. in length and 6 mm. in width.

Phosphate—Place 10 strips in 10 cc. of distilled water to which have been added 1 cc. of nitric acid and 0.5 cc. of ammonium hydroxide. Allow to stand for 10 minutes. Decant the solution, warm, and add 5 cc. of ammonium molybdate T.S. Shake at about 40° C. for 5 minutes. No precipitate of phosphomolybdate should be produced.

Residue on ignition—Ignite carefully 10 strips of the paper to constant weight: the weight of the residue corresponds to not more than 0.4 mg. per strip of about 3 sq. cm.

Rosin acids, etc.—Immerse a strip of the blue paper in a solution of 0.10 Gm. of silver nitrate in 50 cc. of distilled water: the color of the paper does not change in 30 seconds.

Sensitiveness—Drop a 10- to 12-mm. strip into 100 cc. of 0.0005-normal acid, contained in a beaker, and stir continuously: the color of the paper is changed within 45 seconds. The 0.0005-normal acid is prepared by diluting 1 cc. of tenth-normal hydrochloric acid with freshly boiled and cooled distilled water to 200 cc.

Litmus Paper, Red—Usually in the form of strips about 50 mm. in length and 6 mm. in width.

Red Litmus Paper meets the requirements for *phosphate*, *residue on ignition*, and *rosin acids, etc.*, under *Litmus Paper, Blue*.

Sensitiveness—Drop a 10- to 12-mm. strip into 100 cc. of 0.0005-normal sodium hydroxide, contained in a beaker, and stir continuously: the color of the paper changes within 30 seconds. The 0.0005-normal sodium hydroxide is prepared by diluting 1 cc. of tenth-normal sodium hydroxide with freshly boiled and cooled distilled water to 200 cc.

Phenolphthalein Paper—Prepared from a 0.1 per cent solution of phenolphthalein in 50 per cent alcohol.

Starch Iodide Paper—Strips of white filter paper impregnated with a solution of 0.5 Gm. of potassium iodide in 100 cc. of freshly prepared starch T.S.

Turmeric Paper—Strips of white filter paper impregnated with turmeric T.S.

Sensitiveness—Dip a strip of the paper, of about 1.5 cm. length, in a solution of 1.0 mg. of boric acid in 5 cc. of distilled water, previously mixed with 1 cc. of hydrochloric acid. After 1 minute remove the paper from the liquid and allow it to dry: the yellow color changes to brown. Now moisten the paper with ammonia T.S.: the color of the paper changes to greenish black.

Volumetric Solutions

Normal Solutions—Normal solutions are solutions which contain 1 gram equivalent weight of the active substance in each 1000 cc. of solution; that is, an amount equivalent to 1.0080 Gm. of hydrogen or 8.000 Gm. of oxygen. Normal solutions and solutions bearing a specific relationship to "normal solutions," and used in volumetric determinations are designated as follows: Normal, N/1 or 1 N; double-normal, 2 N; half-normal, N/2 or 0.5 N; tenth-normal, N/10 or 0.1 N; fiftieth-normal, N/50 or 0.02 N; hundredth-normal, N/100 or 0.01 N; two-hundredth-normal, N/200 or 0.005 N; thousandth-normal, N/1000 or 0.001 N.

Molar Solutions are solutions which contain in 1000 cc. a gram-molecule equivalent of the reagent. Thus: a molar solution of sulfuric acid would contain 98.08 Gm. of H_2SO_4 in a liter of the solution, and a molar solution of potassium dichromate would contain 294.21 Gm. of $\text{K}_2\text{Cr}_2\text{O}_7$ in a liter of the solution. Solutions containing in 1000 cc. one-tenth of a gram-molecule of the reagent are designated "tenth-molar" M/10, and similarly indicated for other molarities.

Empirical Solutions—It is frequently difficult to maintain the theoretical standard of many solutions. For this reason it is not essential that such standard normalities be maintained, or even attained originally. A solution of approximately the desired normality is prepared and the correction factor accurately determined. This correction factor is used in all calculations where such empirical solutions are employed. As the value of a standard solution may change upon standing, the concentration should frequently be redetermined.

All volumetric solutions, whether made by direct solution or by dilution of a stronger solution, must be thoroughly mixed by vigorous shaking before standardization.

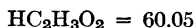
When solutions of a particular substance are used in several normalities, the details of the preparation and standardization are usually given for the normality most frequently required. Stronger or weaker solutions are prepared and standardized in the same general manner as described, using proportionate amounts of material. It is possible in many instances to prepare accurately lower normalities by making an exact dilution of the stronger solutions. Alkali hydroxide solutions, when prepared by dilution, should be standardized by the method of titration described under the stronger solution.

Low normalities, such as one-hundredth or lower, of solutions which are not stable as, for instance, one-hundredth-normal potassium permanganate, one-hundredth or lower normality sodium thiosulfate, are preferably prepared by exactly diluting the higher normality with thoroughly boiled and cooled distilled water on the same day they are required for use.

Preparation and Methods of Standardization of Volumetric Solutions

Under volumetric solutions 1 or 2 methods are usually given for standardization, but other methods of standardization, capable of yielding at least the same degree of accuracy, may be used.

Acetic Acid, Double-Normal



120.10 Gm. in 1000 cc.

Add 116 cc. of glacial acetic acid to sufficient distilled water to make 1000 cc. after cooling to room temperature.

Ammonium Thiocyanate, Tenth-Normal



7.612 Gm. in 1000 cc.

Dissolve about 8 Gm. of reagent ammonium thiocyanate in 1000 cc. of distilled water, and determine the exact normality by titrating the solution against tenth-normal silver nitrate as follows:

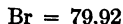
Measure accurately from a burette about 30 cc. of the tenth-normal silver nitrate into a glass-stoppered flask. Dilute with 50 cc. of distilled water, then add 2 cc. of nitric acid and 2 cc. of ferric-ammonium sulfate T.S. and titrate with the ammonium thiocyanate solution. Calculate the normality, and if desired adjust the solution exactly to tenth-normal.

*One cubic centimeter of Tenth-Normal Ammonium Thiocyanate
is the equivalent of:*

	Gram
Ammonium Thiocyanate, NH_4SCN	0.007612
Mercuric Oxide, HgO	0.01083
Mercury, Hg	0.01003
Silver, Ag	0.01079
Silver Nitrate, AgNO_3	0.01699

Bromine, Tenth-Normal

Koppeschaar's Solution



7.992 Gm. in 1000 cc.

Dissolve 3 Gm. of potassium bromate and 15 Gm. of potassium bromide in sufficient distilled water to make 1000 cc. and determine its exact normality as follows:

Measure accurately from a burette about 25 cc. of the solution into a 500-cc. iodine flask and dilute with 120 cc. of distilled water. Add 5 cc. of hydrochloric acid, stopper the flask, and shake it gently. Then add 5 cc. of potassium iodide T.S., re-stopper, shake the mixture, allow it to stand for 5 minutes, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Calculate the normality and, if desired, adjust exactly to tenth-normal.

Preserve it in dark amber-colored, glass-stoppered bottles.

*One cubic centimeter of Tenth-Normal Bromine
is the equivalent of:*

	Gram
Bromine, Br.....	0.007992
Hexylresorcinol, $C_{12}H_{18}O_2$	0.004857
Phenol, C_6H_5OH	0.001569
Phenolsulfonphthalein, $C_{19}H_{14}O_5S$	0.004430
Resorcinol, $C_6H_4(OH)_2$	0.001835

Ceric Sulfate, Tenth-Normal

$$Ce(SO_4)_2 = 332.25$$

33.23 Gm. in 1000 cc.

Dissolve 42 Gm. of reagent ceric sulfate in about 500 cc. of distilled water containing 28 cc. of sulfuric acid, warming if necessary. When solution is complete, cool, add sufficient distilled water to make 1000 cc., and mix well. Standardize the solution as follows:

Weigh accurately from 0.17 to 0.20 Gm. of clean, dry reagent iron wire and transfer to a 250-cc. or a 300-cc. flask. Add 50 cc. of diluted sulfuric acid and close the flask with a valve-stopper prepared as described in the assay for Potassium Chlorate, page 702. Heat on a steam bath until the iron is dissolved. Cool the solution, dilute it with 50 cc. of freshly boiled and cooled distilled water, add 2 drops of ortho-phenanthroline T.S., and titrate with the ceric sulfate solution from a burette until the red color is changed to pale blue. Calculate the normality and, if desired, adjust the solution exactly to tenth-normal.

*One cubic centimeter of Tenth-Normal Ceric Sulfate
is the equivalent of:*

	Gram
Ceric Sulfate, anhydrous $Ce(SO_4)_2$	0.03323
Iron, Fe.....	0.005585
Ferrous Carbonate, $FeCO_3$	0.01159
Ferrous Sulfate, $FeSO_4 \cdot 7H_2O$	0.02780
Menadione, $C_{11}H_8O_2$	0.008609

Ceric Sulfate, Fiftieth-Normal

Dilute exactly 200 cc. of the tenth-normal solution with sufficient of a mixture of equal volumes of diluted sulfuric acid and distilled water to make exactly 1000 cc.

*One cubic centimeter of Fiftieth-Normal Ceric Sulfate
is the equivalent of:*

	Gram
Ceric Sulfate, Anhydrous, $Ce(SO_4)_2$	0.006646
Menadione, $C_{11}H_8O_2$	0.001722
Potassium Chloride (by Cobaltinitrite Method)	0.00100

Hydrochloric Acid, Normal

$$HCl = 36.47$$

36.47 Gm. in 1000 cc.

Dilute 95 cc. of hydrochloric acid with distilled water to make 1000 cc.

This solution may be standardized by one of the following methods:

Method I. Accurately weigh about 1.5 Gm. of reagent anhydrous sodium carbonate which has been heated at a temperature of about 270°C . for 1 hour. Dissolve it in 100 cc. of distilled water and add 2 drops of methyl orange T.S. Add the acid slowly from a burette, with constant stirring, until the color is changed from yellow to pale pink. Calculate the normality and, if desired, adjust exactly to normal.

Method II. Measure accurately from a burette 20 cc. of the acid into a 300-cc. beaker. Dilute with 130 cc. of distilled water and add 5 drops of nitric acid. Now add slowly, with constant stirring, 40 cc. of a 10 per cent solution of silver nitrate, or more if necessary, until precipitation is complete. Boil the mixture cautiously for 5 minutes, and allow the solution to stand in the dark until the precipitate has settled to the bottom of the beaker and the supernatant liquid has become clear. Transfer the precipitate completely to a tared filtering crucible and wash it with distilled water, slightly acidified with nitric acid, until the washings give no test for silver. Dry to constant weight at about 110°C . From the weight of silver chloride obtained, calculate the normality of the hydrochloric acid and, if desired, adjust it exactly to normal. The silver chloride should be protected from light as much as possible during the determination.

*One cubic centimeter of Normal Hydrochloric Acid
is the equivalent of:*

	Gram
Hydrogen Chloride, HCl	0.03647
Barium Carbonate, BaCO_3	0.09869
Barium Hydroxide, $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$	0.1578
Calcium Carbonate, CaCO_3	0.05005
Calcium Hydroxide, $\text{Ca}(\text{OH})_2$	0.03705
Calcium Oxide, CaO	0.02804
Potassium Hydroxide, KOH	0.05610
Sodium Borate, anhydrous, $\text{Na}_2\text{B}_4\text{O}_7$	0.1006
Sodium Borate, hydrated, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$	0.1907
Sodium Cacodylate, anhydrous, $\text{Na}(\text{CH}_3)_2\text{AsO}_2$	0.1600
Sodium Carbonate, anhydrous, Na_2CO_3	0.05300
Sodium Hydroxide, NaOH	0.04001

Hydrochloric Acid, Half-Normal

*One cubic centimeter of Half-Normal Hydrochloric Acid
is the equivalent of:*

	Gram
Hydrogen Chloride, HCl	0.01823

Other factors are identical with those given under Half-normal Sulfuric Acid.

Hydrochloric Acid, Tenth-Normal

*One cubic centimeter of Tenth-Normal Hydrochloric Acid
is the equivalent of:*

	Gram
Hydrogen Chloride, HCl.....	0.003647
Ethylenediamine, $C_2H_4(NH_2)_2$	0.003005
Sodium Benzoate, $NaC_7H_5O_2$	0.01441

Other factors are identical with those given under Tenth-normal Sulfuric Acid.

Hydrochloric Acid, Fiftieth-Normal

*One cubic centimeter of Fiftieth-Normal Hydrochloric Acid
is the equivalent of:*

	Gram
Hydrogen Chloride, HCl.....	0.0007294

Other factors are identical with those given under Fiftieth-normal Sulfuric Acid.

Hydrochloric Acid, Hundredth-Normal

*One cubic centimeter of Hundredth-Normal Hydrochloric Acid
is the equivalent of:*

	Gram
Hydrogen Chloride, HCl.....	0.0003647

Hydrochloric Acid, Thousandth-Normal

*One cubic centimeter of Thousandth-Normal Hydrochloric Acid
is the equivalent of:*

	Gram
Hydrogen Chloride, HCl.....	0.00003647

Iodine, Tenth-Normal

$I = 126.92$

12.692 Gm. in 1000 cc.

Method I. Weigh accurately about 12.75 Gm. of reagent iodine and transfer it quickly into a solution of 36 Gm. of potassium iodide in 100 cc. of distilled water. After solution is complete, add 3 drops of hydrochloric acid and dilute to exactly 1000 cc. at 25° C. From the weight of the iodine used calculate the normality. The normality of the solution should frequently be redetermined.

Method II. Dissolve about 14 Gm. of reagent iodine in a solution of 36 Gm. of potassium iodide in 100 cc. of distilled water, add 3 drops of hydrochloric acid and dilute to 1000 cc.

Weigh accurately about 0.15 Gm. of reagent arsenic trioxide and dissolve it in 20 cc. of normal sodium hydroxide by warming, if necessary. Dilute with 40 cc. of distilled water, add 2 drops of methyl orange T.S. and follow with diluted hydro-

chloric acid until the yellow color is changed to pink. Then add 2 Gm. of reagent sodium bicarbonate, dilute with 50 cc. of distilled water, and add 3 cc. of starch T.S. Slowly add the iodine solution from a burette until a permanent blue color is produced. Calculate the normality and, if desired, adjust exactly to tenth-normal.

Preserve in glass-stoppered bottles.

*One cubic centimeter of Tenth-Normal Iodine
is the equivalent of:*

	Gram
Iodine, I.....	0.01269
Acetone, (CH ₃) ₂ CO.....	0.000968
Antimony and Potassium Tartrate, hydrated, K(SbO)C ₄ H ₄ O ₆ .- ½H ₂ O.....	0.01670
Arsenic, in arsenous compounds, As.....	0.003746
Arsenous Iodide, AsI ₃	0.02279
Arsenic Trioxide (Arsenous Acid), As ₂ O ₃	0.004946
Ascorbic Acid, C ₆ H ₈ O ₆	0.008806
Hydrogen Sulfide, H ₂ S.....	0.001704
Iron, Fe.....	0.005585
Mercurous Chloride, HgCl.....	0.02361
Mercurous Iodide, HgI.....	0.03275
Mercury (in mercurous compounds), Hg.....	0.02006
Methylthionine Chloride, anhydrous, C ₁₆ H ₁₈ N ₃ ClS.....	0.005331
Sodium Bisulfite, NaHSO ₃	0.005204
Sodium Cacodylate, anhydrous, Na(CH ₃) ₂ AsO ₂	0.007999
Sodium Sulfite, anhydrous, Na ₂ SO ₃	0.006303
Sodium Thiosulfate, anhydrous, Na ₂ S ₂ O ₃	0.01581
Sodium Thiosulfate, hydrated, Na ₂ S ₂ O ₃ .5H ₂ O.....	0.02482
Sulfur Dioxide, SO ₂	0.003203

Oxalic Acid, Tenth-Normal



6.3035 Gm. in 1000 cc.

Dissolve 6.45 Gm. of reagent oxalic acid in sufficient distilled water to measure 1000 cc. Ascertain its normality by titration against freshly standardized tenth-normal potassium permanganate as directed under Tenth-Normal Potassium Permanganate, page 756, and, if desired, adjust to exactly tenth-normal.

Preserve in glass-stoppered bottles, protected from light.

*One cubic centimeter of Tenth-Normal Oxalic Acid
is the equivalent of:*

	Gram
Oxalic Acid, hydrated, H ₂ C ₂ O ₄ .2H ₂ O.....	0.006303
Lead, Pb.....	0.01036
Lead Acetate, anhydrous, Pb(C ₂ H ₃ O ₂) ₂	0.01627
Lead Acetate, hydrated, Pb(C ₂ H ₃ O ₂) ₂ .3H ₂ O.....	0.01897
Lead Monoxide, PbO.....	0.01116
Potassium Permanganate, KMnO ₄	0.003161

Oxalic Acid, Hundredth-Normal

*One cubic centimeter of Hundredth-Normal Oxalic Acid
is the equivalent of:*

	Gram
Oxalic Acid, hydrated, $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$	0.0006303

Potassium Arsenite, Tenth-Normal

$\text{KAsO}_2 = 146.01$

7.3005 Gm. in 1000 cc.

Dissolve 4.9455 Gm. of reagent arsenic trioxide, which has been pulverized and dried to constant weight at 100°C ., in 75 cc. of normal potassium hydroxide. Add 40 Gm. of potassium bicarbonate, dissolved in about 200 cc. of distilled water, and dilute with distilled water to exactly 1000 cc. at 25°C .

*One cubic centimeter of Tenth-Normal Potassium Arsenite
is the equivalent of:*

	Gram
Iodine, I.....	0.01269
Arsenic Trioxide, As_2O_3	0.004946

Potassium Dichromate, Tenth-Normal

$\text{K}_2\text{Cr}_2\text{O}_7 = 294.21$

4.9035 Gm. in 1000 cc.

Method I. Dissolve 4.9035 Gm. of reagent potassium dichromate, which has been pulverized and dried to constant weight at 120°C ., in sufficient distilled water to measure exactly 1000 cc. at standard temperature.

Method II. Dissolve about 5 Gm. of reagent potassium dichromate in 1000 cc. of distilled water, transfer exactly 25 cc. of this solution to a 500-cc. glass-stoppered flask, add 2 Gm. of potassium iodide (free from iodate), dilute with 200 cc. of distilled water, add 5 cc. of hydrochloric acid, allow to stand for 10 minutes in a dark place, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. at the end of the titration as the indicator.

*One cubic centimeter of Tenth-Normal Potassium Dichromate
is the equivalent of:*

	Gram
Potassium Dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$	0.004904
Ferrous Carbonate, FeCO_3	0.01159
Ferrous Sulfate, anhydrous, FeSO_4	0.01519
Ferrous Sulfate, hydrated, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	0.02780
Iron, in ferrous compounds, Fe.....	0.005585
Lead Acetate, anhydrous $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$	0.01084
Lead Monoxide, PbO	0.007440
Quinacrine (base), $\text{C}_{23}\text{H}_{30}\text{ClN}_3\text{O}$	0.006666
Quinacrine Hydrochloride, anhydrous, $\text{C}_{23}\text{H}_{30}\text{ClN}_3\text{O} \cdot 2\text{HCl}$	0.007882
Quinacrine Hydrochloride, $\text{C}_{23}\text{H}_{30}\text{ClN}_3\text{O} \cdot 2\text{HCl} \cdot 2\text{H}_2\text{O}$	0.008482

Potassium Hydroxide, Normal

$\text{KOH} = 56.10$

56.10 Gm. in 1000 cc.

Normal Potassium Hydroxide is used only as an alternative solution. It is prepared and standardized in exactly the same manner as normal sodium hydroxide,

using an equivalent quantity of the potassium hydroxide for preparing the solution. The factors for this solution are the same as for normal sodium hydroxide.

Potassium Hydroxide, Alcoholic, Half-Normal

Dissolve about 35 Gm. of potassium hydroxide in 20 cc. of distilled water and add sufficient aldehyde-free alcohol to make 1000 cc. Allow the solution to stand in a tightly stoppered bottle (using either a glass or a rubber stopper) for 24 hours. Then quickly decant the clear supernatant liquid into a bottle provided with a well-fitting rubber-stopper, and standardize as follows:

Measure accurately, from a burette, about 25 cc. of half-normal hydrochloric acid. Dilute with 50 cc. of distilled water, add 2 drops of phenolphthalein T.S., and titrate with the alcoholic potassium hydroxide solution until a permanent, pale pink color is produced. Calculate the normality.

NOTE—Keep this solution in tightly stoppered bottles protected from light. It should be standardized at the same temperature at which it is used.

*One cubic centimeter of Half-Normal Alcoholic Potassium Hydroxide
is the equivalent of:*

	Gram
Potassium Hydroxide, KOH.....	0.02805
Benzaldehyde, $C_6H_5.CHO$	0.05306
Borneol, $C_{10}H_{17}OH$	0.07712
Bornyl Acetate, $C_{10}H_{17}C_2H_3O_2$	0.09814
Linalyl Acetate, $C_{10}H_{17}C_2H_3O_2$	0.09814
Menthol, $C_{10}H_{19}OH$	0.07813
Menthyl Acetate, $C_{10}H_{19}C_2H_3O_2$	0.09915
Methyl Salicylate, $CH_3C_7H_5O_3$	0.07607
Santalol, $C_{15}H_{24}O$	0.1102

Potassium Hydroxide Alcoholic, Tenth-Normal

Prepare as described under Potassium Hydroxide Alcoholic, Half-Normal, using about 7 Gm. of potassium hydroxide, and standardize the solution with tenth-normal hydrochloric acid.

*One cubic centimeter of Tenth-Normal Alcoholic
Potassium Hydroxide is the equivalent of:*

	Gram
Neocinchophen, $C_{19}H_{17}O_2N$	0.02913
Potassium Hydroxide, KOH.....	0.005610

Potassium Iodate, Twentieth-Molar

$KIO_3 = 214.02$

10.701 Gm. in 1000 cc.

Dissolve 10.701 Gm. of reagent potassium iodate, previously dried to constant weight at $110^\circ C.$, in sufficient distilled water to make 1000 cc. at $25^\circ C.$

*One cubic centimeter of Twentieth-Molar Potassium Iodate
is the equivalent of:*

	Gram
Potassium Iodide, KI.....	0.01660
Sodium Iodide, NaI.....	0.01499
Iodine, I.....	0.01269

Potassium Iodate, Sixtieth-Molar

Dissolve 3.567 Gm. of reagent potassium iodate, previously dried to constant weight at 110° C., in sufficient distilled water to make 1000 cc. at 25° C.

Potassium Permanganate, Tenth-Normal

$\text{KMnO}_4 = 158.03$

3.161 Gm. in 1000 cc.

Dissolve about 3.3 Gm. of potassium permanganate in 1000 cc. of distilled water in a flask and boil the solution for about 15 minutes. Stopper the flask and allow it to stand for at least 2 days before filtering through asbestos. Ascertain its exact normality by titration against reagent sodium oxalate as follows:

Weigh accurately about 0.2 Gm. of reagent sodium oxalate, previously dried to constant weight at 110° C., and dissolve it in 250 cc. of distilled water. Add 7 cc. of sulfuric acid, heat to about 70° C., and then slowly add the permanganate solution from a burette, with constant stirring, until a pale pink color is produced which persists for 15 seconds. The temperature at the conclusion of the titration should not be less than 60° C. Calculate the normality of the solution and, if desired, adjust the solution exactly to tenth-normal.

Burettes provided with glass stopcocks must be employed when titrating with this solution. It should be frequently restandardized. Preserve it in glass-stoppered, amber-colored bottles.

*One cubic centimeter of Tenth-Normal Potassium Permanganate
is the equivalent of:*

	Gram
Potassium Permanganate, KMnO_4	0.003161
Calcium Bromide, anhydrous, CaBr_2	0.009996
Calcium Carbonate, CaCO_3	0.005005
Calcium Chloride, anhydrous, CaCl_2	0.00555
Calcium Hydroxide, $\text{Ca}(\text{OH})_2$	0.003705
Calcium Lactate, $\text{Ca}(\text{C}_3\text{H}_5\text{O}_3)_2$	0.01091
Calcium Mandelate, $(\text{C}_6\text{H}_5.\text{CHOH}.\text{COO})_2\text{Ca}$	0.01712
Calcium Oxide, CaO	0.002804
Ferrous Carbonate, FeCO_3	0.01159
Ferrous Sulfate, anhydrous, FeSO_4	0.01519
Ferrous Sulfate, hydrated, $\text{FeSO}_4.7\text{H}_2\text{O}$	0.02780
Hydrogen Peroxide, H_2O_2	0.001701
Iron, in ferrous compounds, Fe.....	0.005585
Lead Dioxide, PbO_2	0.01196
Oxygen, O.....	0.0008
Potassium Chlorate, KClO_3	0.002043

	Gram
Sodium Nitrite, NaNO_2	0.003451
Sodium Oxalate, $\text{Na}_2\text{C}_2\text{O}_4$	0.006701

Potassium Permanganate, Hundredth-Normal

One cubic centimeter of Hundredth-Normal Potassium Permanganate is the equivalent of:

	Gram
Calcium, Ca.....	0.0002004
Calcium Oxide, CaO	0.0002804
Calcium Chloride, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	0.0007352
Potassium Permanganate, KMnO_4	0.0003161

Silver Nitrate, Tenth-Normal

$\text{AgNO}_3 = 169.89$

16.989 Gm. in 1000 cc.

Method I. Dissolve 17.006 Gm. of reagent silver nitrate, previously dried at 110°C ., in sufficient distilled water to make 1000 cc. at 25°C .

Method II. Dissolve about 17.5 Gm. of silver nitrate in 1000 cc. of distilled water and standardize the solution as follows:

Measure accurately, from a burette, about 40 cc. of the silver nitrate solution and dilute with about 100 cc. of distilled water. Heat the solution and add slowly with continuous stirring, diluted hydrochloric acid until precipitation of the silver is complete. Boil the mixture cautiously for about 5 minutes, then allow it to stand in the dark until the precipitate has settled and the supernatant liquid has become clear.

Transfer the precipitate completely to a tared filtering crucible, wash it with small portions of distilled water, slightly acidified with nitric acid. Dry the precipitate to constant weight at 110°C . From the weight of the silver chloride obtained calculate the normality of the silver nitrate solution and, if desired, adjust it exactly to tenth-normal. The silver chloride should be protected from light as much as possible during the determination.

One cubic centimeter of Tenth-Normal Silver Nitrate is the equivalent of:

	Gram
Silver Nitrate, AgNO_3	0.01699
Allyl Isothiocyanate, $\text{C}_3\text{H}_5\text{NCS}$	0.004958
Ammonium Bromide, NH_4Br	0.009796
Ammonium Chloride, NH_4Cl	0.005350
Bromine, Br	0.007992
Calcium Bromide, anhydrous, CaBr_2	0.009996
Calcium Bromide, dihydrate, $\text{CaBr}_2 \cdot 2\text{H}_2\text{O}$	0.01180
Calcium Chloride, anhydrous, CaCl_2	0.005550
Calcium Chloride, dihydrate $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	0.007352
Chlorobutanol, $\text{C}_4\text{H}_7\text{OCl}_3$	0.005916
Chlorine, Cl	0.003546
Chloroform, CHCl_3	0.003980

	Gram
Ferrous Iodide, FeI_2	0.01548
Hydrocyanic Acid, HCN , potassium chromate as indicator.....	0.002703
Hydrocyanic Acid, HCN , to first formation of precipitate.....	0.005405
Hydrogen Iodide, HI	0.01279
Iodine, I	0.01269
<i>o</i> -Methoxycinnamic Aldehyde, $\text{C}_{10}\text{H}_{10}\text{O}_2$	0.01622
Potassium Bromide, KBr	0.01190
Potassium Chloride, KCl	0.007455
Potassium Nitrate, KNO_3	0.01011
Sodium Bromide, NaBr	0.01029
Sodium Chloride, NaCl	0.005845
Sodium Nitrite, NaNO_2 , by chlorate method.....	0.02070
Theophylline, anhydrous, $\text{C}_7\text{H}_8\text{N}_4\text{O}_2$	0.01802
Theophylline, $\text{C}_7\text{H}_8\text{N}_4\text{O}_2 \cdot \text{H}_2\text{O}$	0.01982
Tribromoethanol, $\text{C}_2\text{H}_3\text{Br}_3\text{O}$	0.009426
Zinc Chloride, ZnCl_2	0.006815

Silver Nitrate, Hundredth-Normal

To exactly 10 cc. of tenth-normal silver nitrate add 1 drop of nitric acid, dilute with sufficient distilled water to make 100 cc., and mix thoroughly.

*One cubic centimeter of Hundredth-Normal Silver Nitrate
is the equivalent of:*

	Gram
Silver Nitrate, AgNO_3	0.001699
Chlorine, Cl	0.0003546
Silver, Ag	0.001079

Sodium Hydroxide, Normal

$\text{NaOH} = 40.01$

40.01 Gm. in 1000 cc.

Dissolve 45 Gm. of sodium hydroxide in about 950 cc. of distilled water. Add a freshly prepared saturated solution of reagent barium hydroxide until no more precipitate forms. Shake the mixture thoroughly and allow it to stand over night in a stoppered bottle. Decant the clear liquid or filter the solution and standardize it by one of the following methods:

Method I. Accurately measure 30 cc. of normal hydrochloric or normal sulfuric acid, dilute with 50 cc. of carbon dioxide-free distilled water, add 2 drops of phenolphthalein T.S., and titrate with the sodium hydroxide solution to the production of a permanent pink color. Calculate the normality of the sodium hydroxide solution and, if desired, adjust it exactly to normal with freshly boiled and cooled distilled water.

Method II. Dry about 5 Gm. of reagent potassium biphthalate at 100°C . for 3 hours and weigh accurately. If the potassium biphthalate is in the form of large crystals, they should be crushed before drying. Dissolve it in 75 cc. of carbon dioxide-free distilled water, add 2 drops of phenolphthalein T.S., and titrate with the sodium hydroxide solution to the production of a permanent pink color. Calculate the normality of the sodium hydroxide solution and if desired adjust exactly to normal with freshly boiled and cooled distilled water.

NOTE—Solutions of alkali hydroxides absorb carbon dioxide when exposed to the air. They should therefore be preserved in bottles with well-fitted, suitable stoppers, provided with a tube filled with a mixture of sodium hydroxide and lime (soda-lime tubes) so that air entering the container must pass through this tube which will absorb the carbon dioxide.

Standard solutions of sodium hydroxide should be frequently restandardized.

*One cubic centimeter of Normal Sodium Hydroxide
is the equivalent of:*

	Gram
Sodium Hydroxide, NaOH.....	0.04001
Acetic Acid, $\text{HC}_2\text{H}_3\text{O}_2$	0.06005
Acetic Anhydride, $(\text{CH}_3\text{CO})_2\text{O}$	0.05104
Ammonium Acetate, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$	0.07708
Boric Acid, H_3BO_3	0.06184
Calcium Phosphate, Tribasic, $\text{Ca}_3(\text{PO}_4)_2$	0.006745
Chloral Hydrate, $\text{C}_2\text{H}_3\text{Cl}_3\text{O}_2$	0.1654
Citric Acid, $\text{H}_3\text{C}_6\text{H}_5\text{O}_7 \cdot \text{H}_2\text{O}$	0.07005
Formaldehyde, HCHO	0.03003
Glyceryl Borate (Boroglycerin), $\text{C}_3\text{H}_5\text{BO}_3$	0.09989
Hydrogen Chloride, HCl	0.03647
Hypophosphorous Acid, HPH_2O_2	0.06600
Lactic Acid, $\text{HC}_3\text{H}_5\text{O}_3$	0.09008
Magnesium Phosphate, Tribasic, anhydrous, $\text{Mg}_3(\text{PO}_4)_2$	0.005717
Nitric Acid, HNO_3	0.06302
Oxalic Acid, hydrated, $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$	0.06304
Paraformaldehyde, $(\text{HCHO})_3$	0.03003
Phosphoric Acid, H_3PO_4 (to form Na_2HPO_4 with phenolphthalein)	0.04900
Potassium Bitartrate, $\text{KHC}_4\text{H}_4\text{O}_6$	0.1882
Potassium Biphthalate, $\text{KHC}_8\text{H}_4(\text{COO})_2$	0.2042
Potassium Hydroxide, KOH	0.05610
Sodium Biphosphate, $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$	0.1380
Sodium Biphosphate, anhydrous, NaH_2PO_4	0.1200
Sodium Bitartrate, $\text{NaHC}_4\text{H}_4\text{O}_6 \cdot \text{H}_2\text{O}$	0.1901
Sulfuric Acid, H_2SO_4	0.04904
Sulfur Trioxide, SO_3	0.04003
Tartaric Acid, $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$	0.07505
Trichloroacetic Acid, $\text{CCl}_3 \cdot \text{COOH}$	0.1634

Sodium Hydroxide, Half-Normal

Preserve as directed under normal sodium hydroxide, page 758. This solution should be frequently restandardized.

*One cubic centimeter of Half-Normal Sodium Hydroxide
is the equivalent of:*

	Gram
Sodium Hydroxide, NaOH.....	0.020005
Acetylsalicylic Acid, $\text{C}_9\text{H}_8\text{O}_4$	0.04504

Sodium Hydroxide, Tenth-Normal

4.001 Gm. in 1000 cc.

Preserve as directed under normal sodium hydroxide, page 758. This solution should be frequently restandardized.

One cubic centimeter of Tenth-Normal Sodium Hydroxide is the equivalent of:

	Gram
Sodium Hydroxide, NaOH.....	0.004001
Acetylsalicylic Acid, $C_9H_8O_4$	0.01802
Benzoic Acid, $C_7H_6O_2$	0.01221
Boric Acid, H_3BO_3	0.006184
Citric Acid, $H_3C_6H_5O_7 \cdot H_2O$	0.006404
Eucaïne Hydrochloride, $C_{15}H_{21}O_2N \cdot HCl$	0.02838
Mandelic Acid, $C_8H_8O_3$	0.01521
Nicotinic Acid, $C_6H_5O_2N$	0.01231
Potassium Biphthalate, $KHC_6H_4(COO)_2$	0.02042
Salicylic Acid, $C_7H_6O_3$	0.01381
Sodium Salicylate, $NaC_7H_5O_3$	0.01601

Sodium Hydroxide, Twentieth-Normal

Preserve as directed under normal sodium hydroxide, page 758. This solution should be frequently restandardized.

One cubic centimeter of Twentieth-Normal Sodium Hydroxide is the equivalent of:

	Gram
Sodium Hydroxide, NaOH.....	0.002001

Sodium Hydroxide, Fiftieth-Normal

Preserve as directed under normal sodium hydroxide, page 758. This solution should be frequently restandardized.

One cubic centimeter of Fiftieth-Normal Sodium Hydroxide is the equivalent of:

	Gram
Sodium Hydroxide, NaOH.....	0.0008001

Sodium Nitrite, Tenth-Molar $NaNO_2 = 69.01$

6.90 Gm. in 1000 cc.

Dissolve 7.5 Gm. of sodium nitrite in sufficient distilled water to measure 1000 cc. and standardize as follows:

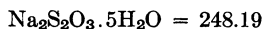
Weigh accurately about 0.5 Gm. of sulfanilamide reference standard previously dried for 3 hours at $100^\circ C$. and transfer it to a beaker or casserole. Add 50 cc. of

distilled water and 5 cc. of hydrochloric acid, and stir well until dissolved. Cool to 15° C., and add about 25 Gm. of crushed ice, then titrate slowly with the sodium nitrite solution, stirring vigorously, until a blue color is produced immediately when a glass rod dipped in the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete the end-point should be reproducible after the mixture has been standing for 1 minute.

*One cubic centimeter of Tenth-Molar Sodium Nitrite
is the equivalent of:*

	Gram
Pamaquin, Base, $C_{19}H_{29}N_{30}$	0.03154
Sodium Nitrite, $NaNO_2$	0.006901
Sulfanilamide, $C_6H_8O_2N_2S$	0.01722
Sulfapyridine, $C_{11}H_{11}N_3O_2S$	0.02493
Sulfapyridine Sodium, Anhydrous, $C_{11}H_{10}N_3O_2SNa$	0.02713
Sulfathiazole, $C_9H_9N_3O_2S_2$	0.02553

Sodium Thiosulfate, Tenth-Normal



24.819 Gm. in 1000 cc.

Dissolve about 26 Gm. of sodium thiosulfate and 0.2 Gm. of sodium carbonate in 1000 cc. of recently boiled and cooled distilled water.

Standardize the solution by titration against tenth-normal iodine, or against tenth-normal potassium dichromate by the following method:

Measure accurately 30 cc. of tenth-normal potassium dichromate into a glass-stoppered flask and dilute it with 50 cc. of distilled water. Add 2 Gm. of potassium iodide and 5 cc. of hydrochloric acid, stopper, and allow to stand for 10 minutes. Dilute with 100 cc. of distilled water and titrate the liberated iodine with the sodium thiosulfate solution. When the solution has assumed a yellowish green color, add starch T.S. and continue with the titration to the discharge of the blue color. Calculate the normality of the sodium thiosulfate solution and, if desired, adjust exactly to tenth-normal.

This solution should be frequently restandardized.

*One cubic centimeter of Tenth-Normal Sodium Thiosulfate
is the equivalent of:*

	Gram
Sodium Thiosulfate, $Na_2S_2O_3 \cdot 5H_2O$	0.02482
Amyl Nitrite, $C_5H_{11}NO_2$	0.01172
Arsenic, As, in arsphenamine, carbarsone, neoarsphenamine and sulfarsphenamine	0.003746
Ascaridol, $C_{10}H_{16}O_2$	0.00665
Bromine, Br.....	0.007992
Chlorine, Cl.....	0.003546
Chlorine, Cl, in chloramine-T.....	0.001773
Chromium Trioxide, CrO_3	0.003334

	Gram
Cupric Sulfate, anhydrous, CuSO_4	0.01596
Cupric Sulfate, hydrated, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	0.02497
Ethyl Nitrite, $\text{C}_2\text{H}_5\text{NO}_2$	0.007507
Glyceryl Trinitrate, $\text{C}_3\text{H}_5(\text{NO}_3)_3$	0.01135
Iodine, I.....	0.01269
Iodine, I, in thymol iodide, calcium iodobehenate and iodine ointment (by U. S. P. XII method).....	0.002115
Iron, Fe, in ferric salts.....	0.005585
Potassium Bromate, KBrO_3	0.002784
Potassium Dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$	0.004904
Potassium Iodate, KIO_3	0.003567
Sodium Hypochlorite, NaClO	0.003723

Sodium Thiosulfate, Two-Hundredth-Normal

Dilute exactly 50 cc. of tenth-normal sodium thiosulfate with sufficient freshly boiled and cooled distilled water to make 1000 cc. This solution should not be used if it has been prepared longer than 7 days.

One cubic centimeter of Two-Hundredth-Normal Sodium Thiosulfate is the equivalent of:

	Gram
Sodium Thiosulfate, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$	0.001241
Glyceryl Trinitrate, $\text{C}_3\text{H}_5(\text{NO}_3)_3$	0.0005677
Iodine, I.....	0.0006346
Iodine, I, in Thyroxin and Thyroid Gland (by U. S. P. XII method)	0.0001058

Sodium Thiosulfate, Thousandth-Normal

Dilute exactly 10 cc. of tenth-normal sodium thiosulfate with sufficient freshly boiled and cooled distilled water to make 1000 cc. This solution is prepared on the day it is used. Each cc. is equivalent to 0.1269 mg. of iodine (I), and 0.10 mg. of zinc (Zn).

Sulfuric Acid, Normal

$\text{H}_2\text{SO}_4 = 98.08$

49.04 Gm. in 1000 cc.

Add slowly, with stirring, 30 cc. of sulfuric acid to about 1020 cc. of distilled water, allow to cool to 25°C ., and determine its normality by titration against sodium carbonate as described under Normal Hydrochloric Acid or gravimetrically as follows:

Measure accurately 20 cc. of the acid into a 500-cc. beaker and dilute with 250 cc. of distilled water. Add 1 cc. of hydrochloric acid, heat to boiling, and add gradually, with continuous stirring, hot barium chloride T.S. until precipitation is complete. Heat the mixture on a water bath for 1 hour. Collect the precipitate on a filter, wash with hot distilled water until free of chloride, dry, and ignite to constant weight. From the weight of the barium sulfate thus obtained, calculate the normality of the solution and, if desired, adjust exactly to normal.

*One cubic centimeter of Normal Sulfuric Acid
is the equivalent of:*

	Gram
Sulfuric Acid, H_2SO_4	0.04904
Ammonia Gas, NH_3	0.01703
Ammonium Acetate, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$	0.07708
Calcium Oxide, CaO	0.02804
Magnesium Hydroxide, $\text{Mg}(\text{OH})_2$	0.02917
Magnesium Oxide, MgO	0.02016
Methenamine, $(\text{CH}_2)_6\text{N}_4$	0.03505
Potassium Acetate, $\text{KC}_2\text{H}_3\text{O}_2$	0.09814
Potassium Bicarbonate, KHCO_3	0.1001
Potassium Carbonate, anhydrous, K_2CO_3 , methyl orange as indicator	0.06910
Potassium Carbonate, anhydrous, K_2CO_3 , phenolphthalein as indicator	0.1382
Potassium Hydroxide, KOH	0.05610
Sodium Bicarbonate, NaHCO_3	0.08402
Sodium Borate, hydrated, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$	0.1907
Sodium Carbonate, anhydrous, Na_2CO_3 , methyl orange as indicator	0.05300
Sodium Carbonate, anhydrous, Na_2CO_3 , phenolphthalein as indicator	0.1060
Sodium Carbonate, monohydrated, $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$, methyl orange as indicator	0.06201
Sodium Hydroxide, NaOH	0.04001
Zinc Oxide, ZnO	0.04069

Sulfuric Acid, Half-Normal

*One cubic centimeter of Half-Normal Sulfuric Acid
is the equivalent of:*

	Gram
Sulfuric Acid, H_2SO_4	0.02452
Ammonia Gas, NH_3	0.008516
Ammonium Carbonate, $(\text{NH}_4)_2\text{CO}_3$	0.04805
Benzaldehyde, $\text{C}_6\text{H}_5\text{CHO}$	0.05306
Citral, $\text{C}_{10}\text{H}_{16}\text{O}$	0.07612
Nitrogen, N	0.007004
Potassium Acetate, $\text{KC}_2\text{H}_3\text{O}_2$	0.04907
Potassium and Sodium Tartrate, anhydrous, $\text{KNaC}_4\text{H}_4\text{O}_6$	0.05254
Potassium Citrate, anhydrous, $\text{K}_3\text{C}_6\text{H}_5\text{O}_7$	0.05107
Potassium Hydroxide, KOH	0.02805
Sodium Acetate, anhydrous, $\text{NaC}_2\text{H}_3\text{O}_2$	0.04102
Sodium Benzoate, $\text{NaC}_7\text{H}_5\text{O}_2$	0.07206
Sodium Borate, anhydrous, $\text{Na}_2\text{B}_4\text{O}_7$	0.05032
Sodium Borate, hydrated, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$	0.09536
Sodium Citrate, anhydrous, $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$	0.04302
Sodium Salicylate, $\text{NaC}_7\text{H}_5\text{O}_3$	0.08005

Sulfuric Acid, Tenth-Normal

*One cubic centimeter of Tenth-Normal Sulfuric Acid
is the equivalent of:*

	Gram
Sulfuric Acid, H_2SO_4	0.004904
Ammonia, NH_3	0.001703
Atropine, $\text{C}_{17}\text{H}_{23}\text{O}_3\text{N}$	0.02894
Calcium Hydroxide, $\text{Ca}(\text{OH})_2$	0.003705
Codeine, $\text{C}_{18}\text{H}_{21}\text{O}_5\text{N}$	0.02994
Dimethylamine, $(\text{CH}_3)_3\text{NH}$	0.004508
Emetine Hydrochloride, anhydrous, $\text{C}_{29}\text{H}_{40}\text{N}_2\text{O}_4 \cdot 2\text{HCl}$	0.02768
Ephedrine, $\text{C}_{10}\text{H}_{15}\text{NO}$	0.01652
Ethyl Carbamate, $\text{C}_3\text{H}_7\text{NO}_2$	0.008909
Ipecac, ether-soluble alkaloids.....	0.02403
Morphine, anhydrous, $\text{C}_{17}\text{H}_{19}\text{O}_3\text{N}$	0.02853
Neostigmine Bromide, $\text{C}_{12}\text{H}_{19}\text{N}_2\text{O}_2\text{Br}$	0.03032
Nicotinamide, $\text{C}_6\text{H}_6\text{N}_2\text{O}$	0.01221
Nitrogen, N	0.0014008
Potassium Hydroxide, KOH	0.005601
Saccharin Sodium, $\text{C}_7\text{H}_4\text{O}_3\text{NSNa} \cdot 2\text{H}_2\text{O}$	0.02412
Sodium Hydroxide, NaOH	0.004001
Strychnine, $\text{C}_{21}\text{H}_{22}\text{O}_2\text{N}_2$	0.03344
Zinc Oxide, ZnO	0.004069

Sulfuric Acid, Fiftieth-Normal

*One cubic centimeter of Fiftieth-Normal Sulfuric Acid
is the equivalent of:*

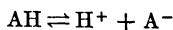
	Gram
Sulfuric Acid, H_2SO_4	0.0009808
Atropine Sulfate, $(\text{C}_{17}\text{H}_{23}\text{O}_3\text{N})_2 \cdot \text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$	0.006498
Belladonna, combined alkaloids.....	0.005787
Codeine Phosphate, $\text{C}_{18}\text{H}_{21}\text{O}_3\text{N} \cdot \text{H}_3\text{PO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$	0.008488
Codeine Sulfate, $(\text{C}_{18}\text{H}_{21}\text{O}_3\text{N})_2 \cdot \text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$	0.007869
Dihydromorphinone Hydrochloride, $\text{C}_{17}\text{H}_{19}\text{O}_3\text{N} \cdot \text{HCl}$	0.006436
Emetine Hydrochloride, anhydrous, $\text{C}_{29}\text{H}_{40}\text{N}_2\text{O}_4 \cdot 2\text{HCl}$	0.005536
Ephedrine Sulfate, $(\text{C}_{10}\text{H}_{15}\text{NO})_2 \cdot \text{H}_2\text{SO}_4$	0.004285
Ergonovine Maleate, $\text{C}_{19}\text{H}_{23}\text{N}_3\text{O}_2 \cdot \text{C}_4\text{H}_4\text{O}_4$	0.008829
Glyceryl Trinitrate, $\text{C}_3\text{H}_5(\text{NO}_3)_3$	0.001514
Hyoscyamus, combined alkaloids.....	0.005787
Morphine, anhydrous, $\text{C}_{17}\text{H}_{19}\text{O}_3\text{N}$	0.005707
Morphine Sulfate, $(\text{C}_{17}\text{H}_{19}\text{O}_3\text{N})_2 \cdot \text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$	0.007588
Neostigmine Methylsulfate, $\text{C}_{13}\text{H}_{22}\text{N}_2\text{O}_6\text{S}$	0.006685
Stramonium, combined alkaloids.....	0.005787
Strychnine Sulfate, $(\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2)_2 \cdot \text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$	0.008570

Hydrogen Ions and pH

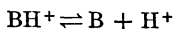
Many of the compounds which are pharmacologically important are acids, bases, or salts. In aqueous or hydroalcoholic solution they tend, in great or small

degree, to dissociate into their respective ions. The concentration and activity of hydrogen ions in a solution influences the concentrations of the anions, cations, and undissociated molecules present in the solution. These factors, in many instances, affect the stability, therapeutic activity, and pharmaceutical elegance of medicaments in aqueous or hydroalcoholic solutions.

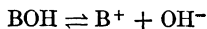
Some Principles of Acid-Base Equilibrium and pH.—The dissociation of acids may be represented by the type description:



In a similar manner the dissociation of substituted ammoniums may be represented by



The dissociation of the metallic hydroxides may be represented by



For the purpose of this discussion, salts, certain acids, and the hydroxides of the alkali metals are assumed to be completely dissociated in dilute aqueous solution.

At equilibrium the ordinary mass action equation will hold as a first approximation for weak acids:

$$\frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]} = K_a \quad (1)$$

$$\frac{[\text{A}^-]}{[\text{HA}]} = \frac{K_a}{[\text{H}^+]} \quad (2)$$

where the brackets indicate molar concentration of each ionic or molecular species.

The constant, K_a , is the classical dissociation constant of the acid. The value of K_a is markedly different for various acids, and for the same acid it is appreciably affected by the presence and concentrations of various ions in solution. The ratio $\frac{[\text{A}^-]}{[\text{HA}]}$ in equation (2) is seen to depend upon the value of K_a and the concentration

of hydrogen ions. Assuming that K_a remains constant, the ratio $\frac{[\text{A}^-]}{[\text{HA}]}$ can be changed only by changing the value of $[\text{H}^+]$. This can be accomplished by the addition of a strongly dissociated acid which increases $[\text{H}^+]$ or the addition of a strongly dissociated base which will decrease the value of $[\text{H}^+]$.

Furthermore, the ratio $\frac{[\text{A}^-]}{[\text{HA}]}$ may be changed by the addition of the acid itself or its salt, but not directly as the ratio of these added quantities, for $[\text{H}^+]$ will have been changed also.

The magnitudes of $[\text{H}^+]$ vary enormously, *i. e.*, from one to one ten-millionth squared or 10^{-14} . The desirability of an exponential or logarithmic scale of expression is at once apparent. The system generally adopted is that devised by Sørensen, namely, the use of the symbol pH, which is defined as *the negative logarithm of the hydrogen-ion concentration*. Hence

$$\text{pH} = -\log [\text{H}^+] \text{ or } \log \frac{1}{[\text{H}^+]} \quad (3)$$

The relation of pH to $[H^+]$ may be seen in the following table:

	pH	Normality in terms of hydrogen ions	Normality in terms of hydroxyl ions
	0	1	10^{-14}
	1	10^{-1}	10^{-13}
	2	10^{-2}	10^{-12}
	3	10^{-3}	10^{-11}
	4	10^{-4}	10^{-10}
	5	10^{-5}	10^{-9}
	6	10^{-6}	10^{-8}
Neutral Point	7	10^{-7}	10^{-7}
	8	10^{-8}	10^{-6}
	9	10^{-9}	10^{-5}
	10	10^{-10}	10^{-4}
	11	10^{-11}	10^{-3}
	12	10^{-12}	10^{-2}
	13	10^{-13}	10^{-1}
	14	10^{-14}	1

The logarithmic nature of this system should be borne in mind constantly in considering changes in hydrogen-ion concentration and its connotation in terms of pH as illustrated in the following table:

$[H^+]$ Times increased or decreased	pH Corresponding change
10	1.00
5	0.70
2	0.30
1.5	0.18
1.1	0.04
1.05	0.02
1.023	0.01

Equation (2) may be written

$$\log \frac{[A^-]}{[HA]} + \log \frac{1}{K_a} = \text{pH} \quad (4)$$

Obviously when the ratio $\frac{[A^-]}{[HA]}$ is unity, $\log \frac{1}{K_a}$ will be equal to pH. Also, when pH is greater than $\log \frac{1}{K_a}$ by two units, practically the entire compound exists as species A^- . When pH, however, is less than $\log \frac{1}{K_a}$ by two units, practically the entire compound exists as species HA. When pH has a value lying within ± 2 units $\log \frac{1}{K_a}$, there will be relatively large proportions of each species present.

The standard device generally used in the determination of hydrogen-ion concentration is the hydrogen half-cell.

A hydrogen half-cell consists of a noble metal electrode, immersed in a solution containing hydrogen ions or substances capable of supplying such ions at the activity symbolized by (H^+) , under a definite partial pressure of hydrogen, P_{H_2} , and supplied with a catalyst such as platinum black to facilitate the half-reaction:



When two such half-cells are placed in liquid junction, the electromotive force E of the cell is defined by

$$E = \frac{RT}{F} \ln \frac{(H^+)'\sqrt{P_{H_2}}}{(H^+)\sqrt{P'_{H_2}}} + E_L, \quad (5)$$

Where $(H^+)'$ is the activity of the hydrogen ions in the half-cell having the greater hydrogen-ion activity, P'_{H_2} is the hydrogen pressure in the same half-cell and E_L is the potential jump at the liquid junction of the half-cells. The latter is not eliminated but is reduced to a small, usually neglected value, by making the junction with saturated potassium chloride solution.

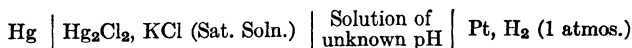
The ultimate standard of reference is the hydrogen half-cell in which the hydrogen-ion activity is unity and the hydrogen pressure is one atmosphere. If this half-cell were used in conjunction with another half-cell of lower hydrogen-ion activity and the hydrogen pressure were the same in the two half-cells, then

$$E = \frac{RT}{F} \ln \frac{1}{(H^+)} \quad \text{or} \quad (6)$$

at 20° C.,

$$E = 0.0581 \log \frac{1}{(H^+)} \quad (7)$$

The foregoing ultimate standard of reference is not used in practice and it is impossible, either to eliminate entirely the liquid junction potential or to calculate it with exactitude. Therefore for pharmacopoeial purposes the following is adopted for approximate measurements:



Employing this cell at 20° C., pH may be calculated by the following equation:

$$pH = \frac{E - 0.2488}{0.0581} \quad (8)$$

The electromotive force is measured by means of a potentiometer.

When the standard 0.05 molar potassium biphthalate solution (page 581) is employed in the foregoing cell, in place of the solution of unknown pH at 20° C., the cell has an electromotive force of 0.4797 volt, corresponding to pH 3.974.

These half-cells employed under the prescribed conditions constitute the reference device for pH measurements for the solutions of the Pharmacopoeia. For pharmacopoeial purposes various electrodes may be employed at the discretion of the operator which are capable of as great a degree, or a greater degree, of accuracy than that set forth in the colorimetric method, namely, ± 0.1 pH.

When the electrometric method is employed for hydroalcoholic solutions and the electromotive force developed converted into pH, the conversion is based on the

assumption that the equation holds for hydroalcoholic solutions as it does for aqueous solutions. Strictly speaking this condition does not obtain. Therefore the values expressed as pH are relative and subject to change with varying concentrations of alcohol.

The term pH is expressed generally by an integer and two significant decimals. The reliability of the value of the figures in the second decimal place is dependent largely on the method employed in carrying out the determination. For pharmacopœial purposes, the expression is given with one decimal only. For practically all purposes of this text, this degree of accuracy is considered sufficient. However, the method to be described is capable of a higher degree of accuracy.

Determination of pH—For convenience the colorimetric method of determining hydrogen-ion concentration has been adopted for pharmacopœial purposes and is to be employed where pigments or proteins present in the solution do not vitiate its use. In these instances the potentiometric method must be employed.

The principle of the colorimetric method depends upon the assumption that an indicator in the same concentration will exhibit the same transition shade in different aqueous solutions if the hydrogen-ion concentrations of the solutions are the same. Having then a series of buffer solutions of definite hydrogen-ion concentrations, comparisons can be made between the shades of color produced in the buffer solutions and that produced by the same indicator in the solution to be tested.

As it was stated previously, the K_a of an acid is affected by the ionic strength of the solution, likewise the K_a of indicators is affected also. This influences the color transition range of the indicator. The electrometric method measures the activity of the hydrogen ions (H^+) and to obtain the same value by the colorimetric method in solutions of various ionic strengths, a correction, known as the salt-error correction, must be employed. In addition, the kinds of ions present in solution and their precipitating influence on the indicator affect the accuracy of the colorimetric method. For pharmacopœial purposes, where the complexity of the medicaments make a simple application of these corrections impossible, the corrections are ignored.

Directions for pH Measurements—In the determination of an unknown pH value, a suitable indicator must first be found. Only indicators which show an intermediate color between the extreme acid and alkaline colors can be used.

The first step in the choice of a suitable indicator is the determination of the approximate pH value of the solution under investigation. A few simple tests will usually supply the necessary information. Add a drop or two of phenolphthalein T.S. to a small portion of the solution. If the indicator remains colorless, the pH of the solution is less than 8.4. A second test is conducted in the same manner, using methyl orange T.S. as the indicator. If the solution assumes the alkaline color (yellow), the pH of the solution is greater than 4.4 and lies somewhere between 4.4 and 8.0. A few more tests with methyl red (pH interval 4.2–6.3), bromothymol blue (6.0–7.6), and phenol red (6.8–8.4) will give a close enough approximation of the pH value to show which indicator may be successfully used in the determination.

Instead of testing small amounts of the liquid with indicator solutions, the spot method, using indicator papers, may be substituted. Also, by using a universal indicator in place of the several indicator solutions suggested above, some time may be saved.

When the approximate pH value has been determined and a suitable indicator

agreed upon, a 3-, 5-, or 10-cc. portion of the unknown solution (depending upon the amount of the liquid available), is transferred to a hard, resistant glass test tube approximately 15 cm. long and 1.5 cm. $\pm$ 0.5 mm. bore, and a measured amount of the indicator solution added. As a rule, 0.10 to 0.20 cc. of a 0.05 per cent indicator solution, added from a 1-cc. pipette, graduated to 0.01 cc. per 10 cc. of the solution being tested, constitutes a proper indicator concentration.

Transfer from 4 to 6 portions of the buffer solutions, the pH values of which overlap that of the unknown solution, to test tubes and treat in exactly the same way as the solution being analyzed. The same amounts of indicator must be added to the unknown and to the buffer solutions. It is also essential that the test tubes used be of the quality and type already indicated. The color of the unknown solution is then compared with the colors of the buffer solutions and the pH value of the solution thus determined.

In judging the colors, observe them against a white background with the light transmitted through the whole length of the tube. A suitable colorimeter may also be used, although it is not necessary in routine work. A sufficient number of reference solutions must be taken so that the color of the unknown falls between two of the series, differing by not more than 0.20 pH. The pH of the unknown can thus be easily approximated to within 0.1 and with practice to 0.05. With buffer solutions differing by 0.1 pH unit or less, the experimental error can be reduced to about 0.02 pH.

Other colorimetric methods capable of the same or a greater degree of accuracy than that required by the Pharmacopoeia may be employed at the discretion of the operator.

The dissociation constants of indicators hold for aqueous solutions only. Alcohol changes this value and therefore for alcoholic solutions a correction factor must be used or the potentiometric method employed.

pH Indicators and Preparation of Their Solutions

The indicators used for colorimetric pH determinations are either weakly acid or weakly basic. Most of the indicators, however, used for this purpose, such as the phthaleins and sulfonated phthaleins, behave like weak acids.

The usual concentration of the indicator solution is 0.05 per cent. From 0.1 to 0.2 cc. of the indicator solution is generally used for 10 cc. of the liquid being examined.

Solutions of indicators of the basic type and of the phthaleins are prepared by dissolving them in alcohol. In preparing solutions of indicators containing an acid group, this group must first be neutralized with sodium hydroxide. The procedure is as follows:

One-tenth (0.100) Gm. of the indicator is triturated in an agate mortar with the volume of twentieth-normal sodium hydroxide specified in the following table, or with its equivalent of fiftieth-normal sodium hydroxide. When the indicator has dissolved the solution is diluted with carbon-dioxide-free distilled water to make 200 cc. (0.05 per cent).

The solutions should be kept in stoppered bottles, and protected from light.

Table of pH Indicators

<i>Indicator</i>	<i>pH Range</i>	<i>Molecular Weight</i>	<i>Color Change</i>	<i>Solvent</i>
Methyl yellow	2.9- 4.0	225	Red-yellow	Alcohol
Bromophenol blue	3.0- 4.6	669	Yellow-blue	3.0 cc. N/20 NaOH
Methyl red	4.2- 6.3	269	Red-yellow	7.4 cc. " "
Bromocresol purple	5.2- 6.8	540	Yellow-purple	3.7 cc. " "
Bromothymol blue	6.0- 7.6	624	Yellow-blue	3.2 cc. " "
Phenol red	6.8- 8.4	354	Yellow-red	5.7 cc. " "
Thymol blue	8.0- 9.6	466	Yellow-blue	4.3 cc. " "
Thymolphthalein	9.3-10.5	430	Colorless-blue	Alcohol

Solutions Used in the Preparation of Buffer Solutions

Fifth-molar hydrochloric acid and fifth-molar sodium hydroxide (carbonate free) are prepared and standardized according to the directions given under standard solutions, page 563.

1. *Potassium Biphthalate Solution*—Dissolve 40.836 Gm. of reagent potassium biphthalate in distilled water and dilute to 1000 cc. to prepare a fifth-molar solution for use in preparing the buffer solutions.

2. *Monopotassium Phosphate Solution*—Dissolve 27.240 Gm. of reagent monopotassium phosphate in distilled water and dilute to 1000 cc. to make a fifth-molar solution for use in preparing the buffer solutions.

3. *Boric Acid and Potassium Chloride Solution*—Dissolve 12.404 Gm. of reagent boric acid and 14.912 Gm. of reagent potassium chloride in distilled water and dilute to 1000 cc. to prepare a fifth-molar solution of these mixed salts.

4. *Potassium Chloride Solution*—Dissolve 14.912 Gm. reagent potassium chloride in distilled water and dilute to 1000 cc. to make a fifth-molar solution for use in preparing the buffer solutions.

5. *Potassium Biphthalate Solution for Hydrogen Electrode*—Solution (1) diluted with three volumes of distilled water at 20° C. prepares twentieth-molar potassium biphthalate solution for checking the hydrogen electrode.

BUFFER MIXTURES OF CLARK AND LUBS

<i>pH</i>	<i>HCl-KCl Mixtures</i>		
1.1	94.56 cc. M/5 HCl	5.44 cc. M/5 KCl	Dilute to 200 cc.
1.2	75.10 cc. M/5 HCl	24.90 cc. M/5 KCl	Dilute to 200 cc.
1.3	59.68 cc. M/5 HCl	40.32 cc. M/5 KCl	Dilute to 200 cc.
1.4	47.40 cc. M/5 HCl	52.60 cc. M/5 KCl	Dilute to 200 cc.
1.5	37.64 cc. M/5 HCl	62.36 cc. M/5 KCl	Dilute to 200 cc.
1.6	29.90 cc. M/5 HCl	70.06 cc. M/5 KCl	Dilute to 200 cc.
1.7	23.76 cc. M/5 HCl	76.24 cc. M/5 KCl	Dilute to 200 cc.
1.8	18.86 cc. M/5 HCl	81.14 cc. M/5 KCl	Dilute to 200 cc.
1.9	14.98 cc. M/5 HCl	85.02 cc. M/5 KCl	Dilute to 200 cc.
2.0	11.90 cc. M/5 HCl	88.10 cc. M/5 KCl	Dilute to 200 cc.
2.1	9.46 cc. M/5 HCl	90.54 cc. M/5 KCl	Dilute to 200 cc.
2.2	7.52 cc. M/5 HCl	92.48 cc. M/5 KCl	Dilute to 200 cc.

pH	<i>Phthalate-HCl Mixtures</i>		
2.2	50 cc. M/5 KHPhtalate	46.60 cc. M/5 HCl	Dilute to 200 cc.
2.4	50 cc. M/5 KHPhtalate	39.60 cc. M/5 HCl	Dilute to 200 cc.
2.6	50 cc. M/5 KHPhtalate	33.00 cc. M/5 HCl	Dilute to 200 cc.
2.8	50 cc. M/5 KHPhtalate	26.50 cc. M/5 HCl	Dilute to 200 cc.
3.0	50 cc. M/5 KHPhtalate	20.40 cc. M/5 HCl	Dilute to 200 cc.
3.2	50 cc. M/5 KHPhtalate	14.80 cc. M/5 HCl	Dilute to 200 cc.
3.4	50 cc. M/5 KHPhtalate	9.95 cc. M/5 HCl	Dilute to 200 cc.
3.6	50 cc. M/5 KHPhtalate	6.00 cc. M/5 HCl	Dilute to 200 cc.
3.8	50 cc. M/5 KHPhtalate	2.65 cc. M/5 HCl	Dilute to 200 cc.

pH	<i>Phthalate-NaOH Mixtures</i>		
4.0	50 cc. M/5 KHPhtalate	0.40 cc. M/5 NaOH	Dilute to 200 cc.
4.2	50 cc. M/5 KHPhtalate	3.65 cc. M/5 NaOH	Dilute to 200 cc.
4.4	50 cc. M/5 KHPhtalate	7.35 cc. M/5 NaOH	Dilute to 200 cc.
4.6	50 cc. M/5 KHPhtalate	12.00 cc. M/5 NaOH	Dilute to 200 cc.
4.8	50 cc. M/5 KHPhtalate	17.50 cc. M/5 NaOH	Dilute to 200 cc.
5.0	50 cc. M/5 KHPhtalate	23.65 cc. M/5 NaOH	Dilute to 200 cc.
5.2	50 cc. M/5 KHPhtalate	29.75 cc. M/5 NaOH	Dilute to 200 cc.
5.4	50 cc. M/5 KHPhtalate	35.25 cc. M/5 NaOH	Dilute to 200 cc.
5.6	50 cc. M/5 KHPhtalate	39.70 cc. M/5 NaOH	Dilute to 200 cc.
5.8	50 cc. M/5 KHPhtalate	43.10 cc. M/5 NaOH	Dilute to 200 cc.
6.0	50 cc. M/5 KHPhtalate	45.40 cc. M/5 NaOH	Dilute to 200 cc.
6.2	50 cc. M/5 KHPhtalate	47.00 cc. M/5 NaOH	Dilute to 200 cc.

pH	<i>KH₂PO₄-NaOH Mixtures</i>		
5.8	50 cc. M/5 KH ₂ PO ₄	3.66 cc. M/5 NaOH	Dilute to 200 cc.
6.0	50 cc. M/5 KH ₂ PO ₄	5.64 cc. M/5 NaOH	Dilute to 200 cc.
6.2	50 cc. M/5 KH ₂ PO ₄	8.55 cc. M/5 NaOH	Dilute to 200 cc.
6.4	50 cc. M/5 KH ₂ PO ₄	12.60 cc. M/5 NaOH	Dilute to 200 cc.
6.6	50 cc. M/5 KH ₂ PO ₄	17.74 cc. M/5 NaOH	Dilute to 200 cc.
6.8	50 cc. M/5 KH ₂ PO ₄	23.60 cc. M/5 NaOH	Dilute to 200 cc.
7.0	50 cc. M/5 KH ₂ PO ₄	29.54 cc. M/5 NaOH	Dilute to 200 cc.
7.2	50 cc. M/5 KH ₂ PO ₄	34.90 cc. M/5 NaOH	Dilute to 200 cc.
7.4	50 cc. M/5 KH ₂ PO ₄	39.34 cc. M/5 NaOH	Dilute to 200 cc.
7.6	50 cc. M/5 KH ₂ PO ₄	42.74 cc. M/5 NaOH	Dilute to 200 cc.
7.8	50 cc. M/5 KH ₂ PO ₄	45.17 cc. M/5 NaOH	Dilute to 200 cc.
8.0	50 cc. M/5 KH ₂ PO ₄	46.85 cc. M/5 NaOH	Dilute to 200 cc.

<i>Boric Acid, KCl-NaOH Mixtures</i>			
7.8	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	2.65 cc. M/5 NaOH	Dilute to 200 cc.
8.0	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	4.00 cc. M/5 NaOH	Dilute to 200 cc.
8.2	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	5.90 cc. M/5 NaOH	Dilute to 200 cc.
8.4	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	8.55 cc. M/5 NaOH	Dilute to 200 cc.
8.6	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	12.00 cc. M/5 NaOH	Dilute to 200 cc.
8.8	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	16.40 cc. M/5 NaOH	Dilute to 200 cc.
9.0	50 cc. M/5 H ₃ BO ₃ , M/5 KCl	21.40 cc. M/5 NaOH	Dilute to 200 cc.

Boric Acid, KCl-NaOH Mixtures

9.2	50 cc. M/5 H_3BO_3 , M/5 KCl	26.70 cc. M/5 NaOH	Dilute to 200 cc.
9.4	50 cc. M/5 H_3BO_3 , M/5 KCl	32.00 cc. M/5 NaOH	Dilute to 200 cc.
9.6	50 cc. M/5 H_3BO_3 , M/5 KCl	36.85 cc. M/5 NaOH	Dilute to 200 cc.
9.8	50 cc. M/5 H_3BO_3 , M/5 KCl	40.80 cc. M/5 NaOH	Dilute to 200 cc.
10.0	50 cc. M/5 H_3BO_3 , M/5 KCl	43.90 cc. M/5 NaOH	Dilute to 200 cc.

Hydrogen-Ion Concentration (pH) of Some Official Substances

The hydrogen-ion concentrations, expressed as pH, of the substances in the following table are given for informative purposes only, and are not intended to be construed as a means for the determination of the purity of these substances. In practice, variations from these figures may frequently be found, as a slight excess of acid or base is, in many instances, desirable and even necessary to insure stability and other qualities in connection with the use of these substances.

When only one figure is given in the table it represents the theoretical pH, or the one generally agreed upon in the literature. For the majority of the alkali- and alkaline earth-salts an approximate range is given within which the pH of these substances, as they usually occur on the market, will fall. Some deviations from these values may, however, be expected, as the presence of even a very slight excess of base or acid in these salts, or of carbon dioxide in their solutions, exercises a pronounced influence upon the hydrogen-ion concentration.

Substance	Concentration	pH
Acid Acetic.....	0.1 molar.....	2.9
Acid Benzoic.....	Saturated solution.....	2.8
Acid Boric.....	0.1 molar.....	5.1
Acid Citric.....	0.1 molar.....	2.1
Acid Hydriodic.....	0.1 molar.....	1.0
Acid Hydrochloric.....	0.1 molar.....	1.0
Acid Hypophosphorous.....	0.1 molar.....	1.5
Acid Lactic.....	0.1 molar.....	2.4
Acid Nitric.....	0.1 molar.....	1.1
Acid Phosphoric.....	0.1 molar.....	1.5
Acid Salicylic.....	Saturated solution.....	2.4
Acid Sulfuric.....	0.05 molar.....	1.2
Acid Tartaric.....	0.1 molar.....	1.9
Acid Trichloroacetic.....	0.1 molar.....	1.2
Alum (Ammonium).....	0.05 molar.....	4.6
Alum (Potassium).....	0.1 molar.....	4.2
Ammonium Bromide.....	0.1 molar.....	4.6
Ammonium Chloride.....	0.1 molar.....	4.6
Ammonia Water.....	0.1 molar.....	11.3
Apomorphine Hydrochloride.....	1 in 300.....	4.8
Arsphenamine.....	1 in 20.....	3.0
Atropine.....	Saturated solution.....	9.5
Atropine Sulfate.....	1 in 100.....	5.4
Barbital Sodium.....	0.1 molar.....	9.4

Substance	Concentration	pH
Caffeine Citrated	1 in 25	2.3
Caffeine with Sodium Benzoate	1 in 25	7.4
Calcium Bromide	0.2 molar	7.0-8.0
Calcium Chloride	0.2 molar	6.5-7.5
Calcium Hydroxide	Saturated solution	12.3
Calcium Lactate	1 in 25	6.0-7.0
Cinchonidine Sulfate	Saturated solution	6.4
Cocaine Hydrochloride	0.1 molar	4.5
Codeine	Saturated solution	9.8
Codeine Phosphate	0.1 molar	4.5
Codeine Sulfate	0.1 molar	5.0
Emetine Hydrochloride	1 in 50	5.6
Ephedrine	1 in 200	10.8
Ephedrine Hydrochloride	1 in 200	5.9
Homatropine Hydrobromide	1 in 100	5.4
Magma Magnesia		10.6
Magnesium Sulfate	0.2 molar	6.0-7.0
Morphine Sulfate	0.1 molar	4.8
Physostigmine Salicylate	1 in 200	5.8
Pilocarpine Nitrate	1 in 100	4.8
Potassium Acetate	0.1 molar	9.7
Potassium Bicarbonate	0.1 molar	8.2
Potassium Bromide	0.2 molar	6.5-8.0
Potassium Carbonate	0.1 molar	11.6
Potassium Hydroxide	0.1 molar	13.5
Potassium Iodide	0.2 molar	7.0-9.0
Potassium Nitrate	0.2 molar	6.5-7.5
Potassium and Sodium Tartrate	0.2 molar	7.0-8.0
Procaine Hydrochloride	0.1 molar	6.0
Quinidine Sulfate	1 in 200	6.4
Quinine	Saturated solution	8.8
Quinine Bisulfate	1 in 25	3.5
Quinine Dihydrochloride	1 in 25	2.6
Quinine Hydrobromide	1 in 25	6.4
Quinine Hydrochloride	1 in 25	6.4
Quinine Sulfate	Saturated solution	6.2
Quinine and Urea Hydrochloride	1 in 20	3.1
Sodium Acetate	0.1 molar	8.9
Sodium Benzoate	0.1 molar	8.0
Sodium Bicarbonate	0.1 molar	8.2
Sodium Biphosphate	0.1 molar	4.5
Sodium Borate	0.1 molar	9.2
Sodium Bromide	0.2 molar	6.5-8.0
Sodium Cacodylate	0.1 molar	7.8
Sodium Carbonate	0.1 molar	11.6
Sodium Chloride	0.2 molar	6.7-7.3
Sodium Hydroxide	0.1 molar	13.5

Substance	Concentration	pH
Sodium Iodide.....	0.2 molar.....	8.0-9.5
Sodium Phosphate (dibasic).....	0.1 molar.....	9.5
Sodium Salicylate.....	0.2 molar.....	5.0-6.0
Sodium Sulfate.....	0.2 molar.....	6.0-7.5
Sodium Thiosulfate.....	0.2 molar.....	6.5-8.0
Strychnine Nitrate.....	1 in 250.....	5.7
Strychnine Sulfate.....	1 in 100.....	5.5
Theobromine with Sodium Salicylate.....	1 in 100.....	10.3

Atomic Weights

Adopted by the International Committee on Chemical Elements (1941)

Oxygen 16.0000

Name	Symbol	Atomic Number	Atomic Weight	Name	Symbol	Atomic Number	Atomic Weight
Aluminum ...	Al	13	26.97	Molybdenum ..	Mo	42	95.95
Antimony....	Sb	51	121.76	Neodymium ...	Nd	60	144.27
Argon.....	A	18	39.944	Neon.....	Ne	10	20.183
Arsenic.....	As	33	74.91	Nickel.....	Ni	28	58.69
Barium.....	Ba	56	137.36	Nitrogen.....	N	7	14.008
Beryllium....	Be	4	9.02	Osmium.....	Os	76	190.2
Bismuth.....	Bi	83	209.00	Oxygen.....	O	8	16.0000
Boron.....	B	5	10.82	Palladium.....	Pd	46	106.7
Bromine.....	Br	35	79.916	Phosphorus....	P	15	30.98
Cadmium.....	Cd	48	112.41	Platinum.....	Pt	78	195.23
Calcium.....	Ca	20	40.08	Potassium.....	K	19	39.096
Carbon.....	C	6	12.010	Praseodymium..	Pr	59	140.92
Cerium.....	Ce	58	140.13	Protactinium..	Pa	91	231
Cesium.....	Cs	55	132.91	Radium.....	Ra	88	226.05
Chlorine.....	Cl	17	35.457	Radon.....	Rn	86	222
Chromium....	Cr	24	52.01	Rhenium.....	Re	75	186.31
Cobalt.....	Co	27	58.94	Rhodium.....	Rh	45	102.91
Columbium..	Cb	41	92.91	Rubidium.....	Rb	37	85.48
Copper.....	Cu	29	63.57	Ruthenium.....	Ru	44	101.7
Dysprosium..	Dy	66	162.46	Samarium.....	Sm	62	150.43
Erbium.....	Er	68	167.2	Scandium.....	Sc	21	45.10
Europium....	Eu	63	152.0	Selenium.....	Se	34	78.96
Fluorine.....	F	9	19.00	Silicon.....	Si	14	28.06
Gadolinium..	Gd	64	156.9	Silver.....	Ag	47	107.880
Gallium.....	Ga	31	69.72	Sodium.....	Na	11	22.997
Germanium..	Ge	32	72.60	Strontium.....	Sr	38	87.63
Gold.....	Au	79	197.2	Sulfur.....	S	16	32.06
Hafnium.....	Hf	72	178.6	Tantalum.....	Ta	73	180.88
Helium.....	He	2	4.003	Tellurium.....	Te	52	127.61
Holmium.....	Ho	67	164.94	Terbium.....	Tb	65	159.2
Hydrogen....	H	1	1.0080	Thallium.....	Tl	81	204.39
Indium.....	In	49	114.76	Thorium.....	Th	90	232.12
Iodine.....	I	53	126.92	Thulium.....	Tm	69	169.4
Iridium.....	Ir	77	193.1	Tin.....	Sn	50	118.70
Iron.....	Fe	26	55.85	Titanium.....	Ti	22	47.90
Krypton.....	Kr	36	83.7	Tungsten.....	W	74	183.92
Lanthanum..	La	57	138.92	Uranium.....	U	92	238.07
Lead.....	Pb	82	207.21	Vanadium.....	V	23	50.95
Lithium.....	Li	3	6.940	Xenon.....	Xe	54	131.3
Lutecium....	Lu	71	174.99	Ytterbium.....	Yb	70	173.04
Magnesium..	Mg	12	24.32	Yttrium.....	Y	39	88.92
Manganese...	Mn	25	54.93	Zinc.....	Zn	30	65.38
Mercury.....	Hg	80	200.61	Zirconium.....	Zr	40	91.22

Atomic and Molecular Weights

Acetaldehyde (Acetic Aldehyde).....	CH_3CHO	44.05
Acetanilid.....	$\text{C}_6\text{H}_5\text{NH}\cdot\text{CH}_3\text{CO}$	135.16
Acetic Anhydride.....	$(\text{CH}_3\text{CO})_2\text{O}$	102.09
Acetone.....	$(\text{CH}_3)_2\text{CO}$	58.08
Acetophenetidin.....	$\text{C}_{10}\text{H}_{13}\text{O}_2\text{N}$	179.21
Acid, Acetic.....	$\text{HC}_2\text{H}_3\text{O}_2$	60.05
“ “ Anhydride (see Acetic Anhydride)		
“ Acetylsalicylic.....	$\text{HC}_7\text{H}_4\text{O}_2\text{C}_2\text{H}_3\text{O}_2$	180.15
“ Aminoacetic.....	$\text{C}_2\text{H}_5\text{O}_2\text{N}$	75.07
“ Acetylcholine Chloride.....	$\text{CH}_3\text{CO}\cdot\text{OCH}_2\text{CH}_2(\text{CH}_3)_3\text{N}\cdot\text{Cl}$	181.663
“ Aminonaphthosulfonic.....	$1,2,4\text{-HC}_{10}\text{H}_8\text{O}_4\text{NS}\cdot\frac{1}{2}\text{H}_2\text{O}$...	248.25
“ Arsenic.....	$\text{H}_3\text{AsO}_4\cdot\frac{1}{2}\text{H}_2\text{O}$	150.94
“ Ascorbic.....	$\text{C}_6\text{H}_8\text{O}_6$	176.12
“ Aurochloric (Chlorauric Acid).....	$\text{HAuCl}_4\cdot 4\text{H}_2\text{O}$	412.10
“ Benzoic.....	$\text{HC}_7\text{H}_5\text{O}_2$	122.12
“ Boric.....	H_3BO_3	61.84
“ Bromauric (Aurobromhydric Acid).....	$\text{HAuBr}_4\cdot 5\text{H}_2\text{O}$	607.95
“ Butyric.....	$\text{HC}_4\text{H}_7\text{O}_2$	88.10
“ Chlorauric (see Aurochloric Acid)		
“ Chloroplatinic.....	$\text{H}_2\text{PtCl}_6\cdot 6\text{H}_2\text{O}$	518.08
“ Cholic.....	$\text{C}_{24}\text{H}_{40}\text{O}_5$	308.56
“ Chromic (Chromium Trioxide).....	CrO_3	100.01
“ Cinnamic (Cinnamylic Acid).....	$\text{HC}_9\text{H}_7\text{O}_2$	148.15
“ Citric.....	$\text{H}_3\text{C}_6\text{H}_5\text{O}_7\cdot \text{H}_2\text{O}$	210.14
“ “ anhydrous.....	$\text{H}_3\text{C}_6\text{H}_5\text{O}_7$	192.12
“ Diethyl-barbituric (see Barbital)		
“ 3,5-Dinitrosalicylic.....	$\text{HC}_7\text{H}_3\text{N}_2\text{O}_7\cdot \text{H}_2\text{O}$	246.13
“ Formic.....	HCHO_2	46.03
“ Gallic.....	$\text{HC}_7\text{H}_5\text{O}_5\cdot \text{H}_2\text{O}$	188.13
“ “ anhydrous.....	$\text{HC}_7\text{H}_5\text{O}_5$	170.12
“ Hydriodic (see Hydrogen Iodide)....	$\text{HI} + \text{water}$	
“ Hydrobromic (see Hydrogen Bromide)	$\text{HBr} + \text{water}$	
“ Hydrochloric (see Hydrogen Chloride)	$\text{HCl} + \text{water}$	
“ Hydrocyanic (see Hydrogen Cyanide)	$\text{HCN} + \text{water}$	
“ Hypophosphorous.....	$\text{H}_3\text{P}_2\text{O}_4$	66.00
“ Iodic.....	HIO_3	175.93
“ Iodoxyquinolinesulfonic 7-8-5.....	$\text{C}_9\text{H}_6\text{INSO}_4$	351.13
“ Lactic.....	$\text{HC}_3\text{H}_5\text{O}_3$	90.08
“ Mandelic.....	$\text{HC}_8\text{H}_7\text{O}_3$	152.14
“ Molybdic.....	H_2MoO_4	161.97
“ Nicotinic.....	$\text{HC}_6\text{H}_4\text{O}_2\text{N}$	123.11
“ Nitric.....	HNO_3	63.02
“ Oleic.....	$\text{HC}_{18}\text{H}_{33}\text{O}_2$	282.45
“ Oxalic.....	$\text{H}_2\text{C}_2\text{O}_4\cdot 2\text{H}_2\text{O}$	126.07
“ “ anhydrous.....	$\text{H}_2\text{C}_2\text{O}_4$	90.04
“ Palmitic.....	$\text{HC}_{16}\text{H}_{31}\text{O}_2$	256.42
“ Perchloric.....	HClO_4	100.47

Acid Phenoldisulfonic.....	$\text{H}_2\text{C}_6\text{H}_3(\text{SO}_3)_2\text{OH}$	254.23
“ Phenylcinchoninic (see Cinchophen)		
“ Phosphomolybdic (approx.).....	$\text{P}_2\text{O}_5 \cdot 24\text{MoO}_3 \cdot 51\text{H}_2\text{O}$	4515.58
“ Phosphoric.....	H_3PO_4	98.00
“ Phosphorous.....	H_2PHO_3	82.00
“ Phosphotungstic (approx.).....	$\text{P}_2\text{O}_5 \cdot 12\text{WO}_3 \cdot 42\text{H}_2\text{O}$	3681.67
“ Picric (see Trinitrophenol)		
“ Picrolonic.....	$\text{C}_{10}\text{H}_8\text{N}_4\text{O}_5$	264.20
“ Pyrogallol (see Pyrogallol)		
“ Salicylic.....	$\text{HC}_7\text{H}_5\text{O}_3$	138.12
“ Selenous.....	H_2SeO_3	128.98
“ Stearic.....	$\text{HC}_{18}\text{H}_{35}\text{O}_2$	284.47
“ Sulfanilic.....	$\text{HC}_6\text{H}_4(\text{NH}_2)\text{SO}_3 \cdot 1\text{H}_2\text{O}$	191.20
“ Sulfosalicylic.....	$\text{HC}_7\text{H}_5\text{O}_6\text{S} \cdot 2\text{H}_2\text{O}$	254.21
“ Sulfuric.....	H_2SO_4	98.08
“ Tartaric.....	$\text{H}_2\text{C}_4\text{H}_4\text{O}_6$	150.09
“ Trichloroacetic.....	$\text{HC}_2\text{Cl}_3\text{O}_2$	163.40
“ Uric.....	$\text{C}_5\text{H}_4\text{N}_4\text{O}_3$	168.11
“ Valeric (Valerianic Acid).....	$\text{HC}_5\text{H}_9\text{O}_2$	102.13
Aconitine.....	$\text{C}_{34}\text{H}_{47}\text{NO}_{11}$	645.72
Alcohol (Ethyl).....	$\text{C}_2\text{H}_5\text{OH}$	46.07
Allyl Isothiocyanate.....	$\text{C}_3\text{H}_5\text{NCS}$	99.15
Allyl-thiocarbamide (Thiosinamine).....	$\text{C}_3\text{H}_5\text{N}_2\text{CSH}_3$	116.18
Alum (see Aluminum and Potassium Sulfate and Aluminum and Ammonium Sulfate)		
Aluminum.....	Al.....	26.97
Aluminum and Ammonium Sulfate (Alum).....	$\text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	453.32
“ “ “ “ anhydrous.....	$\text{AlNH}_4(\text{SO}_4)_2$	237.13
“ “ Potassium Sulfate (Alum).....	$\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	474.38
“ “ “ “ anhydrous.....	$\text{AlK}(\text{SO}_4)_2$	258.19
“ Hydroxide.....	$\text{Al}(\text{OH})_3$	77.99
“ Oxide.....	Al_2O_3	101.94
“ Sulfate.....	$\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$	666.41
“ “ anhydrous.....	$\text{Al}_2(\text{SO}_4)_3$	342.12
Amaranth.....	$\text{C}_{20}\text{H}_{11}\text{N}_2\text{O}_{10}\text{SN}_3$	604.48
p-Aminoacetophenone.....	$\text{C}_8\text{H}_9\text{NO}$	135.16
Aminopyrine.....	$\text{C}_{13}\text{H}_{17}\text{ON}_3$	231.29
Ammonia.....	NH_3	17.03
Ammonium Acetate.....	$\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$	77.08
“ Benzoate.....	$\text{NH}_4\text{C}_7\text{H}_5\text{O}_2$	139.15
“ Bicarbonate.....	NH_4HCO_3	79.06
“ Bromide.....	NH_4Br	97.96
“ Carbamate.....	$\text{NH}_4\text{NH}_2\text{CO}_2$	78.07
“ Carbonate (Normal).....	$(\text{NH}_4)_2\text{CO}_3$	96.09
“ “ (U. S. P.) (approx.).....	$\text{NH}_4\text{HCO}_3 \cdot \text{NH}_4\text{NH}_2\text{CO}_2$	157.13
“ Chloride.....	NH_4Cl	53.50
“ Citrate, Dibasic.....	$(\text{NH}_4)_2\text{HC}_6\text{H}_5\text{O}_7$	226.19
“ Hydroxide.....	NH_4OH	35.05

Ammonium Hypophosphite.....	$\text{NH}_4\text{PH}_2\text{O}_2$	83.04
“ Iodide.....	NH_4I	144.96
“ Molybdate.....	$(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$	1235.95
“ Nitrate.....	NH_4NO_3	80.05
“ Oxalate.....	$(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$	142.12
“ “ anhydrous.....	$(\text{NH}_4)_2\text{C}_2\text{O}_4$	124.10
“ Phosphate.....	$(\text{NH}_4)_2\text{HPO}_4$	132.07
“ Salicylate.....	$\text{NH}_4\text{C}_7\text{H}_5\text{O}_3$	155.15
“ Sodium Phosphate (see Sodium Ammonium Phosphate)		
“ Sulfate.....	$(\text{NH}_4)_2\text{SO}_4$	132.14
“ Sulfide.....	$(\text{NH}_4)_2\text{S}$	68.14
“ Tartrate.....	$(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6$	184.15
“ Thiocyanate.....	NH_4SCN	76.12
“ Vanadate (Metavanadate).....	NH_4VO_3	116.99
Amyl Alcohol (see Isoamyl Alcohol)		
“ Nitrite.....	$\text{C}_5\text{H}_{11}\text{NO}_2$	117.15
Amylene Hydrate.....	$\text{C}_5\text{H}_{11}\text{OH}$	88.15
Anethol.....	$\text{C}_{10}\text{H}_{18}\text{O}$	148.20
Aniline (Phenylamine).....	$\text{C}_6\text{H}_5\text{NH}_2$	93.12
“ Sulfate.....	$(\text{C}_6\text{H}_5\text{NH}_2)_2\text{H}_2\text{SO}_4$	284.32
Antimonous Oxide.....	Sb_2O_3	291.52
Antimony.....	Sb	121.76
Antimony and Potassium Tartrate.....	$\text{K}(\text{SbO})\text{C}_4\text{H}_4\text{O}_6 \cdot \frac{1}{2}\text{H}_2\text{O}$	333.94
“ “ “ “ anhydrous.....	$\text{K}(\text{SbO})\text{C}_4\text{H}_4\text{O}_6$	324.93
Antipyrine.....	$\text{C}_{11}\text{H}_{12}\text{N}_2\text{O}$	188.22
Apomorphine Hydrochloride.....	$\text{C}_{17}\text{H}_{17}\text{O}_2\text{NHCl} \cdot \frac{1}{2}\text{H}_2\text{O}$	312.79
Argon.....	A	39.944
Arsenic.....	As	74.91
Arsenic Pentoxide (Arsenic Acid		
Anhydride).....	As_2O_5	229.82
“ Trioxide (see Arsenous Oxide)		
Arsenous Iodide (Arsenic Triiodide).....	AsI_3	455.67
“ Oxide (Arsenic Trioxide).....	As_2O_3	197.82
“ Sulfide.....	As_2S_3	246.00
Arsphenamine.....	$\text{C}_{12}\text{H}_{15}\text{O}_2\text{N}_2\text{As}_2 \cdot 2\text{HCl} \cdot 2\text{H}_2\text{O}$	475.01
Ascaridol.....	$\text{C}_{10}\text{H}_{16}\text{O}_2$	168.23
Aspidospermine.....	$\text{C}_{22}\text{H}_{30}\text{N}_2\text{O}_2$	354.48
Atropine.....	$\text{C}_{17}\text{H}_{23}\text{O}_3\text{N}$	289.36
“ Sulfate.....	$(\text{C}_{17}\text{H}_{23}\text{O}_3\text{N})_2\text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$	694.82
Auric Chloride.....	AuCl_3	303.57
Azure A (Methylene Azure).....	$\text{C}_{14}\text{H}_{14}\text{ClN}_3\text{S}$	291.79
Barbital.....	$\text{C}_8\text{H}_{12}\text{N}_2\text{O}_3$	184.19
“ Sodium.....	$\text{C}_8\text{H}_{11}\text{N}_2\text{O}_3\text{Na}$	206.18
Barium.....	Ba	137.36
Barium Carbonate.....	BaCO_3	197.37
“ Chloride.....	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$	244.31
“ “ anhydrous.....	BaCl_2	208.27

Barium Chromate.....	BaCrO ₄	253.37
“ Hydroxide.....	Ba(OH) ₂ ·8H ₂ O.....	315.50
“ Nitrate.....	Ba(NO ₃) ₂	261.38
“ Sulfate.....	BaSO ₄	233.42
Benzaldehyde.....	C ₆ H ₅ CHO.....	106.12
Benzene (Benzol).....	C ₆ H ₆	78.11
Benzidine.....	(C ₆ H ₄) ₂ (NH ₂) ₂	184.23
Benzocaine (see Ethyl Aminobenzoate)		
Benzosulfimide (see Saccharin)		
Beryllium (Glucinum).....	Be.....	9.02
Betæucaine Hydrochloride (see Eucaine Hydrochloride)		
Betanaphthol.....	C ₁₀ H ₇ OH.....	144.16
Bismuth.....	Bi.....	209.00
Bismuth Citrate.....	BiC ₆ H ₅ O ₇	398.10
“ Nitrate (normal).....	Bi(NO ₃) ₃ ·5H ₂ O.....	485.10
“ Phosphate.....	BiPO ₄	303.98
“ Subcarbonate (approx.).....	[(BiO) ₂ CO ₃] ₂ ·H ₂ O.....	1038.04
“ Subgallate (approx.).....	Bi(OH) ₂ C ₇ H ₅ O ₅	412.13
“ Subnitrate (approx.).....	Bi(OH) ₂ NO ₃	305.02
“ Subsalcylate (approx.).....	Bi(OH) ₂ C ₇ H ₅ O ₃	380.13
“ Sulfide.....	Bi ₂ S ₃	514.18
“ Trioxide.....	Bi ₂ O ₃	466.00
Borax (see Sodium Borate)		
Borneol.....	C ₁₀ H ₁₇ OH.....	154.24
Bornyl Acetate.....	C ₁₀ H ₁₇ C ₂ H ₃ O ₂	196.28
Boron.....	B.....	10.82
Boron Trioxide.....	B ₂ O ₃	69.64
Bromine.....	Br.....	79.916
Bromoform.....	CHBr ₃	252.77
Bromocresol Purple.....	C ₆ H ₄ SO ₃ C(C ₆ H ₂ CH ₃ BrOH) ₂	540.23
Brucine.....	C ₂₃ H ₂₆ N ₂ O ₄ ·4H ₂ O.....	466.52
“ anhydrous.....	C ₂₃ H ₂₆ N ₂ O ₄	394.45
Butacaine Sulfate.....	(C ₁₈ H ₃₀ N ₂ O ₂) ₂ ·H ₂ SO ₄	710.95
Butyl Aminobenzoate.....	C ₁₁ H ₁₅ O ₂ N.....	193.24
Cadmium.....	Cd.....	112.41
Cadmium Chloride.....	CdCl ₂ ·2H ₂ O.....	219.36
“ “ anhydrous.....	CdCl ₂	183.32
“ Iodide.....	CdI ₂	366.25
“ Sulfate.....	3CdSO ₄ ·8H ₂ O.....	769.54
“ “ anhydrous.....	CdSO ₄	208.47
Caffeine.....	C ₈ H ₁₀ N ₄ O ₂ ·H ₂ O.....	212.21
“ anhydrous.....	C ₈ H ₁₀ N ₄ O ₂	194.19
Calcium.....	Ca.....	40.08
Calcium Biphosphate.....	Ca(H ₂ PO ₄) ₂ ·H ₂ O.....	252.09
“ Bromide.....	CaBr ₂ ·2H ₂ O.....	235.94
“ “ anhydrous.....	CaBr ₂	199.91

Calcium Carbonate.....	CaCO_3	100.09
“ Chloride.....	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	147.03
“ “ anhydrous.....	CaCl_2	110.99
“ Gluconate.....	$\text{CaC}_{12}\text{H}_{22}\text{O}_{14} \cdot \text{H}_2\text{O}$	448.39
“ Glycerophosphate.....	$\text{CaC}_3\text{H}_7\text{PO}_6 \cdot \text{H}_2\text{O}$	228.16
“ “ anhydrous.....	$\text{CaC}_3\text{H}_7\text{PO}_6$	210.15
“ Hydroxide.....	$\text{Ca}(\text{OH})_2$	74.10
“ Hypophosphite.....	$\text{Ca}(\text{PH}_2\text{O}_2)_2$	170.07
“ Iodobehenate.....	$\text{Ca}(\text{C}_{21}\text{H}_{42}\text{IO}_2)_2$	971.03
“ Lactate.....	$\text{Ca}(\text{C}_3\text{H}_5\text{O}_3)_2 \cdot 5\text{H}_2\text{O}$	308.30
“ “ anhydrous.....	$\text{Ca}(\text{C}_3\text{H}_5\text{O}_3)_2$	218.22
“ Mandelate.....	$\text{Ca}(\text{C}_8\text{H}_7\text{O}_3)_2$	342.35
“ Oxide (Lime).....	CaO	56.08
“ Phosphate, tribasic.....	$\text{Ca}_3(\text{PO}_4)_2$	310.20
“ Sulfate.....	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	172.17
“ “ anhydrous.....	CaSO_4	136.14
“ Sulfide (Monosulfide).....	CaS	72.14
Camphor.....	$\text{C}_{10}\text{H}_{16}\text{O}$	152.23
“ Monobromated.....	$\text{C}_{10}\text{H}_{15}\text{BrO}$	231.14
Capryl Alcohol (Secondary N-Octanol).....	$\text{C}_8\text{H}_{17}\text{OH}$	130.22
Carbarsone.....	$\text{C}_7\text{H}_9\text{AsN}_2\text{O}_4$	260.07
Carbon.....	C	12.010
Carbon Dioxide.....	CO_2	44.01
“ Disulfide.....	CS_2	76.13
“ Monoxide.....	CO	28.01
“ Tetrachloride.....	CCl_4	153.84
Carbromal.....	$\text{C}_7\text{H}_{13}\text{N}_2\text{O}_2\text{Br}$	237.11
Cephaeline.....	$\text{C}_{14}\text{H}_{19}\text{O}_2\text{N}$	233.30
Cerium.....	Ce	140.13
Cerium Oxalate.....	$\text{Ce}_2(\text{C}_2\text{O}_4)_3 \cdot 10\text{H}_2\text{O}$	724.48
Ceric Sulfate, anhydrous.....	$\text{Ce}(\text{SO}_4)_2$	332.25
Cesium.....	Cs	132.91
Chloral Hydrate.....	$\text{C}_2\text{Cl}_3\text{H}_3\text{O}_2$	165.42
Chloramine-T.....	$\text{C}_7\text{H}_7\text{ClNO}_2\text{SNa} \cdot 3\text{H}_2\text{O}$	281.70
Chloranil (Tetrachlorobenzoquinone).....	$\text{C}_6\text{Cl}_4\text{O}_2$	245.89
Chloroazodin.....	$\text{C}_2\text{H}_4\text{Cl}_2\text{N}_6$	183.01
Chlorobutanol.....	$\text{C}_4\text{H}_7\text{Cl}_3\text{O}$	177.47
Chlorine.....	Cl	35.457
Chloroform.....	CHCl_3	119.39
Cholesterol (cholesterin).....	$\text{C}_{27}\text{H}_{45}\text{OH}$	386.64
Chromium.....	Cr	52.01
Chromium Oxide.....	Cr_2O_3	152.02
Chromium Trioxide (Chromic Acid).....	CrO_3	100.01
Chromotropic Acid.....	$\text{C}_{10}\text{H}_8\text{O}_8\text{S}_2 \cdot 2\text{H}_2\text{O}$	356.32
Cinchonidine.....	$\text{C}_{19}\text{H}_{22}\text{N}_2\text{O}$	294.38
“ Sulfate.....	$(\text{C}_{19}\text{H}_{22}\text{N}_2\text{O})_2 \cdot \text{H}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$	740.89
“ “ anhydrous.....	$(\text{C}_{19}\text{H}_{22}\text{N}_2\text{O})_2 \cdot \text{H}_2\text{SO}_4$	686.84
Cinchonine.....	$\text{C}_{19}\text{H}_{22}\text{N}_2\text{O}$	294.38

Cinchonine Sulfate.....	$(C_{19}H_{22}N_2O)_2H_2SO_4 \cdot 2H_2O$..	722.87
“ Sulfate anhydrous.....	$(C_{19}H_{22}N_2O)_2H_2SO_4$	686.84
Cinchophen (Phenylcinchoninic Acid).....	$HC_{16}H_{10}O_2N$	249.26
Cineol (Eucalyptol).....	$C_{10}H_{18}O$	154.24
Cinnamic Aldehyde.....	C_9H_8O	132.15
Citral.....	$C_{10}H_{16}O$	152.23
Cobalt.....	Co.....	58.94
Cobaltous Acetate.....	$Co(C_2H_3O_2)_2 \cdot 4H_2O$	249.09
“ Chloride.....	$CoCl_2 \cdot 6H_2O$	237.95
“ “ anhydrous.....	$CoCl_2$	129.85
“ Nitrate.....	$Co(NO_3)_2 \cdot 6H_2O$	291.05
“ “ anhydrous.....	$Co(NO_3)_2$	182.96
“ Sulfate.....	$CoSO_4 \cdot 7H_2O$	281.11
“ “ (Dried).....	$CoSO_4 \cdot 2H_2O$	191.03
Cocaine.....	$C_{17}H_{21}NO_4$	303.35
“ Hydrochloride.....	$C_{17}H_{21}O_4N \cdot HCl$	339.81
Codeine (Methylmorphine).....	$C_{18}H_{21}O_3N \cdot H_2O$	317.37
“ anhydrous.....	$C_{18}H_{21}O_3N$	299.36
“ Phosphate.....	$C_{18}H_{21}O_3NH_3PO_4 \cdot 1\frac{1}{2}H_2O$..	424.39
“ “ anhydrous.....	$C_{18}H_{21}O_3NH_3PO_4$	397.36
“ Sulfate.....	$(C_{18}H_{21}O_3N)_2H_2SO_4 \cdot 5H_2O$..	786.87
“ “ anhydrous.....	$(C_{18}H_{21}O_3N)_2H_2SO_4$	696.79
Colchicine.....	$C_{22}H_{25}NO_6$	399.43
Columbium.....	Cb.....	92.91
Congo Red.....	$C_{32}H_{22}N_6O_6S_2Na_2$	696.66
Coniine.....	$C_8H_{17}N$	127.22
Copper.....	Cu.....	63.57
Cotarnine.....	$C_{12}H_{15}O_4N$	237.25
Cotarnine Chloride.....	$C_{12}H_{14}ClO_3N \cdot H_2O$	273.71
Cresol.....	$C_6H_4(CH_3)OH$	108.13
Crystal Violet (see Methylrosaniline Chloride)		
Cupric Acetate.....	$Cu(C_2H_3O_2)_2 \cdot H_2O$	199.67
Cupric Sulfate.....	$CuSO_4 \cdot 5H_2O$	249.71
“ “ anhydrous.....	$CuSO_4$	159.63
“ Sulfide.....	CuS	95.63
Cyclopropane.....	C_3H_6	42.08
L-Cystine.....	$C_6H_{12}N_2O_4S_2$	240.29
.		
Dextrose.....	$C_6H_{12}O_6 \cdot H_2O$	198.17
“ anhydrous.....	$C_6H_{12}O_6$	180.16
Dihydromorphinone Hydrochloride.....	$C_{17}H_{19}O_3N \cdot HCl$	321.80
Diiodofluorescein.....	$C_{20}H_{10}O_5I_2$	584.12
p-Dimethylaminoazobenzene.....	$C_6H_5NNC_6H_4N(CH_3)_2$	225.28
p-Dimethylaminobenzaldehyde.....	$(CH_3)_2NC_6H_4CHO$	149.19
Dimethylglyoxime.....	$(CH_3)_2C_2(NO_2)_2$	116.12
Dinitrophenylhydrazine.....	$2,4-C_6H_3(NO_2)_2NHNH_2$	198.14
Dioxane.....	$C_4H_4O_2$	88.10
Dipentene.....	$C_{10}H_{16}$	136.23

Diphenylamine.....	(C ₆ H ₅) ₂ NH.....	169.22
Diphenylhydantoin.....	C ₁₅ H ₁₂ N ₂ O ₂	252.25
Diphenylhydantoin Sodium.....	C ₁₅ H ₁₁ N ₂ O ₂ Na.....	274.25
Dithiazone (Diphenylthiocarbazone).....	C ₁₃ H ₁₂ N ₄ S.....	256.32
Dithymol Diiodide (see Thymol Iodide)		
Dysprosium.....	Dy.....	162.46
Emetine.....	C ₂₉ H ₄₀ N ₂ O ₄	480.63
“ Hydrochloride, anhydrous.....	C ₂₉ H ₄₀ N ₂ O ₄ · 2HCl.....	553.56
Eosin Y.....	C ₂₀ H ₆ Br ₄ O ₅ Na ₂	691.91
Ephedrine, anhydrous.....	C ₁₀ H ₁₅ NO.....	165.23
“ Hemihydrate.....	C ₁₀ H ₁₅ NO · ½H ₂ O.....	174.24
“ Hydrochloride.....	C ₁₀ H ₁₅ NO · HCl.....	201.69
“ Sulfate.....	(C ₁₀ H ₁₅ NO) ₂ · H ₂ SO ₄	428.53
Epinephrine, anhydrous.....	C ₉ H ₁₃ O ₃ N.....	183.20
“ Hemihydrate.....	C ₉ H ₁₃ O ₃ N · ½H ₂ O.....	192.21
Erbium.....	Er.....	167.2
Ergorovine Maleate.....	C ₁₉ H ₂₃ N ₃ O ₂ · C ₄ H ₄ O ₄	441.47
Ergotamine Tartrate.....	(C ₃₃ H ₃₅ N ₅ O ₅) ₂ · H ₂ C ₄ H ₄ O ₆	1313.39
Ergotoxine Ethanesulfonate.....	C ₃₅ H ₄₁ O ₆ N ₅ · C ₂ H ₅ SO ₃ H.....	737.85
Erythrityl Tetranitrate.....	C ₄ H ₆ (NO ₃) ₄	302.12
Estradiol Benzoate.....	C ₂₅ H ₂₈ O ₃	376.47
Estrone.....	C ₁₈ H ₂₂ O ₂	270.36
Ether (Ethyl Oxide).....	(C ₂ H ₅) ₂ O.....	74.12
Ethyl Acetate.....	C ₂ H ₅ C ₂ H ₃ O ₂	88.10
“ Aminobenzoate.....	C ₉ H ₁₁ O ₂ N.....	165.19
“ Carbamate.....	CO(OC ₂ H ₅)NH ₂	89.09
“ Chaulmoograte.....	C ₂₀ H ₃₆ O ₂	308.49
“ Chloride.....	C ₂ H ₅ Cl.....	64.52
“ Nitrite.....	C ₂ H ₅ NO ₂	75.07
“ Oxide (see Ether)		
“ Cyanoacetate.....	C ₂ H ₇ O ₂ N.....	113.11
Ethylene.....	C ₂ H ₄	28.05
Ethylenediamine.....	C ₂ H ₄ (NH ₂) ₂	60.10
Ethylene tetrachloride (see Tetrachloroethylene)		
Ethylhydrocupreine Hydrochloride.....	C ₂₁ H ₂₉ N ₂ O ₂ HCl.....	376.92
Ethylmorphine Hydrochloride.....	C ₁₉ H ₂₃ O ₃ NHCl · 2H ₂ O.....	385.88
“ “ anhydrous.....	C ₁₉ H ₂₃ O ₃ NHCl.....	349.85
Eucaïne Hydrochloride (Beta).....	C ₁₅ H ₂₁ O ₂ NHCl · H ₂ O.....	301.81
“ “ “ anhydrous.....	C ₁₅ H ₂₁ O ₂ NHCl.....	283.79
Eucalyptol.....	C ₁₀ H ₁₆ O.....	154.24
Eugenol.....	C ₁₀ H ₁₂ O ₂	164.20
Eucatropine Hydrochloride.....	C ₁₇ H ₂₅ O ₃ N · HCl.....	327.84
Europium.....	Eu.....	152.0
Ferric Acetate.....	Fe(C ₂ H ₃ O ₂) ₃	232.98
“ Ammonium Sulfate.....	FeNH ₄ (SO ₄) ₂ · 12H ₂ O.....	482.20
“ “ “ anhydrous.....	FeNH ₄ (SO ₄) ₂	266.01

Ferric Chloride.....	$\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$	270.32
“ “ anhydrous.....	FeCl_3	162.22
“ Hydroxide.....	$\text{Fe}(\text{OH})_3$	106.87
“ Hypophosphite.....	$\text{Fe}(\text{PH}_2\text{O}_2)_3$	250.84
“ Nitrate.....	$\text{Fe}(\text{NO}_3)_3$	241.87
“ Oxide.....	Fe_2O_3	159.70
“ Sulfate (Tersulfate), anhydrous.....	$\text{Fe}_2(\text{SO}_4)_3$	399.88
Ferrous Carbonate.....	FeCO_3	115.86
“ Iodide.....	FeI_2	309.69
“ Lactate.....	$\text{Fe}(\text{C}_3\text{H}_5\text{O}_3)_2 \cdot 3\text{H}_2\text{O}$	288.04
“ Oxide.....	FeO	71.85
“ Sulfate.....	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	278.02
“ “ anhydrous.....	FeSO_4	151.91
“ “ Exsiccated (approx.).....	$(\text{FeSO}_4)_2 \cdot 3\text{H}_2\text{O}$	357.87
“ Sulfide.....	FeS	87.91
Ferrum.....	Fe	55.85
Fluorescein (Resorcinolphthalein).....	$\text{C}_{20}\text{H}_{12}\text{O}_5$	332.30
“ Sodium.....	$\text{C}_{20}\text{H}_{10}\text{O}_5\text{Na}_2$	376.27
Fluorine.....	F	19.00
Formaldehyde.....	CH_2O	30.03
Furfural.....	$\text{C}_4\text{H}_3\text{O} \cdot \text{CHO}$	96.08
Gadolinium.....	Gd	156.9
Galactose.....	$\text{C}_6\text{H}_{12}\text{O}_6$	180.16
Gallium.....	Ga	69.72
Germanium.....	Ge	72.60
Glucose (Grape Sugar) (see Dextrose)		
Glycerin (Glycerol).....	$\text{C}_3\text{H}_5(\text{OH})_3$	92.09
Glyceryl Triacetate.....	$\text{C}_9\text{H}_{14}\text{O}_6$	218.20
“ Trinitrate (Nitroglycerin).....	$\text{C}_3\text{H}_5(\text{NO}_3)_3$	227.09
Gold.....	Au	197.2
Gold Chloride (Chlorauric Acid).....	$\text{HAuCl}_4 \cdot 4\text{H}_2\text{O}$	412.10
Hafnium.....	Hf	178.6
Helium.....	He	4.003
Hexamethylenamine (see Methenamine)		
Hexylresorcinol.....	$\text{C}_{12}\text{H}_{18}\text{O}_2$	194.26
Histamine Phosphate.....	$\text{C}_5\text{H}_9\text{N}_3 \cdot 2\text{H}_3\text{PO}_4$	307.15
Holmium.....	Ho	164.94
Homatropine.....	$\text{C}_{16}\text{H}_{21}\text{O}_3\text{N}$	275.34
“ Hydrobromide.....	$\text{C}_{16}\text{H}_{21}\text{O}_3\text{N} \cdot \text{HBr}$	356.26
Hydrastine.....	$\text{C}_{21}\text{H}_{21}\text{O}_6\text{N}$	383.39
“ Hydrochloride.....	$\text{C}_{21}\text{H}_{21}\text{O}_6\text{N} \cdot \text{HCl}$	419.85
Hydrastinine Hydrochloride.....	$\text{C}_{11}\text{H}_{11}\text{O}_2\text{N} \cdot \text{HCl}$	225.67
Hydrogen.....	H	1.0080
Hydrogen Bromide.....	HBr	80.92
“ Chloride.....	HCl	36.47
“ Cyanide.....	HCN	27.03

Hydrogen Dioxide (see Hydrogen Peroxide)		
“ Iodide.....	HI.....	127.93
“ Peroxide.....	H ₂ O ₂	34.02
“ Sulfide.....	H ₂ S.....	34.08
Hydroxylamine Hydrochloride.....	NH ₂ OH.HCl.....	69.50
Hyoscine (see Scopolamine)		
Hyoseyamine.....	C ₁₇ H ₂₃ O ₃ N.....	289.36
“ Hydrobromide.....	C ₁₇ H ₂₃ O ₃ NHBr.....	370.29
Indigo Carmine (see Sodium Indigotindisulfonate)		
Indium.....	In.....	114.76
Iodeosin (Tetraiodo-fluorescein).....	C ₂₀ H ₈ I ₄ O ₅	835.94
Iodine.....	I.....	126.92
Iodine Pentoxide.....	I ₂ O ₅	333.84
Iodoform.....	CHI ₃	393.78
Iodophthalein Sodium.....	C ₂₀ H ₈ I ₄ O ₄ Na ₂ .3H ₂ O.....	919.99
Iridium.....	Ir.....	193.1
Iron.....	Fe.....	55.85
Iron Salts (see under Ferric and Ferrous)		
Isatin.....	C ₈ H ₅ O ₂ N.....	147.13
Isoamyl Alcohol.....	C ₈ H ₁₁ OH.....	88.15
Isobutyl Alcohol.....	(CH ₃) ₂ CHCH ₂ OH.....	74.12
Krypton.....	Kr.....	83.7
Lactose (Milk Sugar).....	C ₁₂ H ₂₂ O ₁₁ .H ₂ O.....	360.31
Lanthanum.....	La.....	138.92
Lead.....	Pb.....	207.21
Lead Acetate.....	Pb(C ₂ H ₃ O ₂) ₂ .3H ₂ O.....	379.35
“ “ anhydrous.....	Pb(C ₂ H ₃ O ₂) ₂	325.30
“ “ Basic (see Lead Subacetate)		
“ Carbonate, Basic.....	(PbCO ₃) ₂ Pb(OH) ₂	775.67
“ Chloride.....	PbCl ₂	278.12
“ Chromate.....	PbCrO ₄	323.22
“ Dioxide.....	PbO ₂	239.21
“ Iodide.....	PbI ₂	461.05
“ Monoxide (Lead Oxide).....	PbO.....	223.21
“ Nitrate.....	Pb(NO ₃) ₂	331.23
“ Subacetate.....	Pb(C ₂ H ₃ O ₂) ₂ .2Pb(OH) ₂	807.75
“ Sulfate.....	PbSO ₄	303.27
“ Sulfide.....	PbS.....	239.27
Lime (see Calcium Oxide)		
Limonene.....	C ₁₀ H ₁₆	136.23
Linalyl Acetate.....	C ₁₀ H ₁₇ C ₂ H ₃ O ₂	196.28
Lithium.....	Li.....	6.940
Lithium Benzoate.....	LiC ₇ H ₅ O ₂	128.05
“ Bromide.....	LiBr.....	86.86

Lithium Carbonate	Li_2CO_3	73.89
“ Chloride	LiCl	42.40
“ Citrate	$\text{Li}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 4\text{H}_2\text{O}$	281.98
“ Salicylate	$\text{LiC}_7\text{H}_5\text{O}_3$	144.05
Lutecium	Lu	174.99
Magnesia (see Magnesium Oxide)		
Magnesium	Mg	24.32
Magnesium Carbonate, Basic (approx.)	$(\text{MgCO}_3)_4\text{Mg}(\text{OH})_2 \cdot 5\text{H}_2\text{O}$	485.74
“ Chloride	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	203.33
“ “ anhydrous	MgCl_2	95.23
“ Hydroxide	$\text{Mg}(\text{OH})_2$	58.34
“ Oxide (Magnesia)	MgO	40.32
“ Phosphate, Tribasic	$\text{Mg}_3(\text{PO}_4)_2 \cdot 5\text{H}_2\text{O}$	353.00
“ Phosphate, Tribasic, anhydrous	$\text{Mg}_3(\text{PO}_4)_2$	262.92
“ Pyrophosphate	$\text{Mg}_2\text{P}_2\text{O}_7$	222.60
“ Sulfate	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	246.49
“ “ anhydrous	MgSO_4	120.38
Maltose	$\text{C}_{12}\text{H}_{22}\text{O}_{11} \cdot \text{H}_2\text{O}$	360.31
Manganese	Mn	54.93
Manganese Dioxide	MnO_2	86.93
“ Hypophosphite	$\text{Mn}(\text{PH}_2\text{O}_2)_2 \cdot \text{H}_2\text{O}$	202.94
“ Trisilicate	$\text{Mg}_2\text{Si}_3\text{O}_8 \cdot n\text{H}_2\text{O}$	
Manganous Oxide	MnO	70.93
“ Sulfate	$\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$	223.05
“ “ anhydrous	MnSO_4	150.99
Mannitol	$\text{C}_6\text{H}_8(\text{OH})_6$	182.17
Menadione (2-Methyl-naphthoquinone)	$\text{C}_{11}\text{H}_8\text{O}_2$	172.17
Menthol	$\text{C}_{10}\text{H}_{18}\text{OH}$	156.26
Menthyl Acetate	$\text{C}_{10}\text{H}_{18}\text{C}_2\text{H}_3\text{O}_2$	198.30
Merbaphen	$\text{C}_{16}\text{H}_{16}\text{ClN}_2\text{O}_6\text{HgNa}$	591.37
Mercurammonium Chloride (see Mercury, Ammoniated)		
Mercuric Bromide	HgBr_2	360.44
“ Chloride	HgCl_2	271.52
“ Iodide	HgI_2	454.45
“ Nitrate	$\text{Hg}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$	396.69
“ Oxide	HgO	216.61
“ Potassium Iodide	K_2HgI_4	786.48
“ Salicylate	$\text{HgC}_7\text{H}_4\text{O}_3$	336.71
“ Succinimide	$\text{Hg}(\text{C}_4\text{H}_4\text{O}_2\text{N})_2$	396.77
“ Sulfide	HgS	232.67
Mercurous Chloride	HgCl	236.07
“ Iodide	HgI	327.53
“ Nitrate	$\text{HgNO}_3 \cdot \text{H}_2\text{O}$	280.63
Mercury	Hg	200.61
Mercury, Ammoniated	HgNH_2Cl	252.09
Mersalyl	$\text{C}_{13}\text{H}_{16}\text{HgNO}_6\text{Na}$	505.87
Metaphenylenediamine Hydrochloride	$\text{C}_6\text{H}_4(\text{NH}_2)_2\text{HCl}$	181.07

Methanol.....	CH_3OH	32.04
Methenamine (Hexamethylenamine).....	$\text{C}_6\text{H}_{12}\text{N}_4$	140.19
Methyl Alcohol (see Methanol)		
Methylene Blue (see Methylthionine Chloride)		
2-Methyl-naphthoquinone (see Menadione)		
Methyl Orange.....	$\text{NaC}_{14}\text{H}_{14}\text{N}_3\text{SO}_3$	327.33
“ Red.....	$\text{C}_{14}\text{H}_{14}\text{N}_3\text{CO}_2\text{H}$	269.29
“ Salicylate.....	$\text{CH}_3\text{C}_7\text{H}_5\text{O}_3$	152.14
Methylthionine Chloride (Methylene Blue).....	$\text{C}_{16}\text{H}_{18}\text{N}_3\text{ClS} \cdot 3\text{H}_2\text{O}$	373.89
Molybdenum.....	Mo.....	95.95
Molybdic anhydride.....	MoO_3	143.95
Morphine.....	$\text{C}_{17}\text{H}_{19}\text{O}_3\text{N} \cdot \text{H}_2\text{O}$	303.35
“ anhydrous.....	$\text{C}_{17}\text{H}_{19}\text{O}_3\text{N}$	285.33
“ Hydrochloride.....	$\text{C}_{17}\text{H}_{19}\text{O}_3\text{NHCl} \cdot 3\text{H}_2\text{O}$	375.84
“ “ anhydrous.....	$\text{C}_{17}\text{H}_{19}\text{O}_3\text{NHCl}$	321.80
“ Sulfate.....	$(\text{C}_{17}\text{H}_{19}\text{O}_3\text{N})_2\text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$..	758.82
“ “ anhydrous.....	$(\text{C}_{17}\text{H}_{19}\text{O}_3\text{N})_2\text{H}_2\text{SO}_4$	668.74
Naphthalene.....	C_{10}H_8	128.16
Naphthol (see Betanaphthol)		
Naphthylamine Acetate.....	$\text{C}_{10}\text{H}_7\text{NH}_2\text{HC}_2\text{H}_3\text{O}_2$	203.23
“ Hydrochloride.....	$\text{C}_{10}\text{H}_7\text{NH}_2\text{HCl}$	179.65
Neocinchophen.....	$\text{C}_{19}\text{H}_{17}\text{O}_2\text{N}$	291.33
Neodymium.....	Nd.....	144.27
Neon.....	Ne.....	20.183
Neostigmine Bromide.....	$\text{C}_{12}\text{H}_{19}\text{BrN}_2\text{O}_2$	303.20
“ Methylsulfate.....	$\text{C}_{13}\text{H}_{22}\text{N}_2\text{O}_6\text{S}$	334.38
Nickel.....	Ni.....	58.69
Nickelous Oxide.....	NiO	74.69
“ Sulfate.....	$\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$	280.86
Nicotinamide.....	$\text{C}_6\text{H}_6\text{N}_2\text{O}$	122.12
Nitric Oxide.....	NO.....	30.01
Nitrogen.....	N.....	14.008
Nitrogen Monoxide (see Nitrous Oxide)		
Nitroglycerin (see Glyceryl Trinitrate)		
Nitrous Oxide.....	N_2O	44.02
Orange G.....	$\text{C}_{16}\text{H}_{10}\text{N}_2\text{S}_2\text{Na}$	317.37
Osmium.....	Os.....	190.2
Osmium Tetroxide (Osmic Acid).....	OsO_4	254.20
Ouabain.....	$\text{C}_{29}\text{H}_{44}\text{O}_{12} \cdot 8\text{H}_2\text{O}$	728.77
“ anhydrous.....	$\text{C}_{29}\text{H}_{44}\text{O}_{12}$	584.64
Oxygen.....	O.....	16.0000
Palladium.....	Pd.....	106.7
Palladous Chloride.....	PdCl_2	177.61
Pamaquine Naphthoate.....	$\text{C}_{42}\text{H}_{45}\text{N}_3\text{O}_7$	703.80
Paraformaldehyde (Trioxymethylene).....	$(\text{CH}_2\text{O})_3$	90.08

Paraldehyde.....	$C_6H_{12}O_3$	132.16
Pentobarbital Sodium.....	$C_{11}H_{17}N_2O_3Na$	248.26
Phenacaine Hydrochloride.....	$C_{18}H_{22}N_2O_2 \cdot HCl \cdot H_2O$	352.85
<i>o</i> -Phenanthroline.....	$C_{12}H_8N_2 \cdot H_2O$	198.22
Phenobarbital.....	$C_{12}H_{12}N_2O_3$	232.23
" Sodium.....	$C_{12}H_{11}N_2O_3Na$	254.22
Phenol.....	C_6H_5OH	94.11
Phenolphthalein.....	$C_{20}H_{14}O_4$	318.31
Phenolsulfonphthalein.....	$C_{19}H_{14}O_5S$	354.36
Phenylhydrazine.....	$C_6H_5NHNH_2$	108.14
" Hydrochloride.....	$C_6H_5NHNH_2HCl$	144.61
Phenyl Salicylate (Salol).....	$C_6H_5C_7H_5O_3$	214.21
Phloroglucinol.....	$C_6H_3(OH)_3 \cdot 2H_2O$	162.14
Phosphorus.....	P.....	30.98
" Pentoxide (Phosphoric anhydride).....	P_2O_5	141.96
Physostigmine.....	$C_{15}H_{21}N_3O_2$	275.34
" Salicylate.....	$C_{15}H_{21}N_3O_2C_7H_6O_3$	413.46
" Sulfate.....	$(C_{15}H_{21}N_3O_2)_2H_2SO_4$	648.76
Picrotoxin.....	$C_{30}H_{34}O_{13}$	602.57
Pilocarpine.....	$C_{11}H_{16}N_2O_2$	208.25
" Hydrochloride.....	$C_{11}H_{16}N_2O_2HCl$	244.72
Pilocarpine Nitrate.....	$C_{11}H_{16}N_2O_2HNO_3$	271.27
Piperine.....	$C_{17}H_{19}O_3N$	285.33
Platinic Chloride (see Acid, Chloroplatinic)		
Platinum.....	Pt.....	195.23
Potassium.....	K.....	39.096
Potassium Acetate.....	$KC_2H_3O_2$	98.14
" Arsenite (Metarsenite).....	$KAsO_2$	146.01
" Bicarbonate.....	$KHCO_3$	100.11
" Bichromate (see Potassium Dichromate)		
" Biphosphate (see Potassium Phosphate monobasic)		
" Bipthalate.....	$KHC_8H_4O_4$	204.22
" Bisulfate.....	$KHSO_4$	136.16
" Bitartrate.....	$KHC_4H_4O_6$	188.18
" Bromate.....	$KBrO_3$	167.01
" Bromide.....	KBr	119.01
" Carbonate, anhydrous.....	K_2CO_3	138.20
" Carbonate, sesquihydrate.....	$K_2CO_3 \cdot 1\frac{1}{2}H_2O$	165.23
" Chlorate.....	$KClO_3$	122.55
" Chloride.....	KCl	74.55
" Chromate.....	K_2CrO_4	194.20
" Citrate.....	$K_3C_6H_5O_7 \cdot H_2O$	324.40
" " anhydrous.....	$K_3C_6H_5O_7$	306.39
" Cyanide.....	KCN	65.11
" Dichromate (Bichromate).....	$K_2Cr_2O_7$	294.21
" Ferricyanide.....	$K_3Fe(CN)_6$	329.25
" Ferrocyanide.....	$K_4Fe(CN)_6 \cdot 3H_2O$	422.39

Potassium Fluoride.....	KF. 2H ₂ O.....	94.13
“ Hydroxide.....	KOH.....	56.10
“ Hypophosphite.....	KPH ₂ O ₂	104.09
“ Iodate.....	KIO ₃	214.02
“ Iodide.....	KI.....	166.02
“ Nitrate.....	KNO ₃	101.10
“ Nitrite.....	KNO ₂	85.10
“ Oxalate.....	K ₂ C ₂ O ₄ . H ₂ O.....	184.23
“ Perchlorate.....	KClO ₄	138.55
“ Permanganate.....	KMnO ₄	158.03
“ Phosphate, Monobasic.....	KH ₂ PO ₄	136.09
“ “ Dibasic.....	K ₂ HPO ₄	174.18
“ Sodium Tartrate.....	KNaC ₄ H ₄ O ₆ . 4H ₂ O.....	282.23
“ “ “ anhydrous.....	KNaC ₄ H ₄ O ₆	210.17
“ Sulfate.....	K ₂ SO ₄	174.25
“ Tartrate.....	K ₂ C ₄ H ₄ O ₆ . ½H ₂ O.....	235.27
“ “ anhydrous.....	K ₂ C ₄ H ₄ O ₆	226.26
“ Thiocyanate.....	KSCN.....	97.17
Praseodymium.....	Pr.....	140.92
Procaine Hydrochloride.....	C ₁₃ H ₂₀ N ₂ O ₂ . HCl.....	272.77
Protactinium.....	Pa.....	231.
Pyridine.....	C ₅ H ₅ N.....	79.10
Pyrogallol (Pyrogallic Acid).....	C ₆ H ₃ (OH) ₃	126.11
Quinacrine Hydrochloride.....	C ₂₃ H ₃₀ ClN ₃ O. 2HCl. 2H ₂ O....	508.91
“ “ anhydrous.....	C ₂₃ H ₃₀ ClN ₃ O. 2HCl.....	472.89
Quinidine.....	C ₂₀ H ₂₄ N ₂ O ₂	324.41
“ Sulfate.....	(C ₂₀ H ₂₄ N ₂ O ₂) ₂ H ₂ SO ₄ . 2H ₂ O....	782.92
“ “ anhydrous.....	(C ₂₀ H ₂₄ N ₂ O ₂) ₂ H ₂ SO ₄	746.89
Quinine.....	C ₂₀ H ₂₄ N ₂ O ₂ . 3H ₂ O.....	378.46
“ anhydrous.....	C ₂₀ H ₂₄ N ₂ O ₂	324.41
“ Bisulfate.....	C ₂₀ H ₂₄ N ₂ O ₂ H ₂ SO ₄ . 7H ₂ O....	548.60
“ “ anhydrous.....	C ₂₀ H ₂₄ N ₂ O ₂ H ₂ SO ₄	422.48
“ Dihydrochloride.....	C ₂₀ H ₂₄ N ₂ O ₂ . 2HCl.....	397.34
“ Ethyl Carbonate.....	C ₂₀ H ₂₃ N ₂ O ₂ . CO ₂ . C ₂ H ₅	396.47
“ Hydrochloride.....	C ₂₀ H ₂₄ N ₂ O ₂ HCl. 2H ₂ O....	396.91
“ “ anhydrous.....	C ₂₀ H ₂₄ N ₂ O ₂ HCl.....	360.87
“ Salicylate.....	C ₂₀ H ₂₄ N ₂ O ₂ C ₇ H ₆ O ₃ . H ₂ O....	480.54
“ “ anhydrous.....	C ₂₀ H ₂₄ N ₂ O ₂ C ₇ H ₆ O ₃	462.53
“ Sulfate.....	(C ₂₀ H ₂₄ N ₂ O ₂) ₂ H ₂ SO ₄ . 2H ₂ O....	782.92
“ “ anhydrous.....	(C ₂₀ H ₂₄ N ₂ O ₂) ₂ H ₂ SO ₄	746.89
“ and Urea Hydrochloride.....	C ₂₀ H ₂₄ N ₂ O ₂ HCl.CO(NH ₂) ₂ . HCl. 5H ₂ O.....	547.48
Radium.....	Ra.....	226.05
Radon.....	Rn.....	222.
Resorcinol (Resorcin).....	C ₆ H ₄ (OH) ₂	110.11
Resorcinolphthalein (see Fluorescein)		

Rhenium.....	Re.....	186.31
Rhodium.....	Rh.....	102.91
Riboflavin.....	$C_{17}H_{20}N_4O_6$	376.36
Rubidium.....	Rb.....	85.48
Ruthenium.....	Ru.....	101.7
Saccharin.....	$C_7H_5O_3NS$	183.18
“ Sodium.....	$C_7H_4O_3NSNa \cdot 2H_2O$	241.20
Safrol.....	$C_{10}H_{10}O_2$	162.18
Salicin.....	$C_{13}H_{18}O_7$	286.27
Salicylaldehyde (o-Hydroxybenzaldehyde).....	HOC_6H_4CHO	122.12
Salol (see Phenyl Salicylate)		
Samarium.....	Sm.....	150.43
Santalol.....	$C_{15}H_{24}O$	220.34
Santonin.....	$C_{15}H_{18}O_3$	246.29
Scandium.....	Sc.....	45.10
Scopolamine (Hyoscine).....	$C_{17}H_{21}NO_4$	303.35
“ Hydrobromide.....	$C_{17}H_{21}NO_4HBr \cdot 3H_2O$	438.32
“ “ anhydrous.....	$C_{17}H_{21}NO_4HBr$	384.27
Selenium.....	Se.....	78.96
Silicon.....	Si.....	28.06
Silicon Dioxide (Silica).....	SiO_2	60.06
Silver.....	Ag.....	107.880
Silver Chloride.....	$AgCl$	143.34
“ Cyanide.....	$AgCN$	133.90
“ Iodide.....	AgI	234.80
“ Nitrate.....	$AgNO_3$	169.89
“ Nitrite.....	$AgNO_2$	153.89
“ Oxide.....	Ag_2O	231.76
“ Sulfate.....	Ag_2SO_4	311.82
“ Sulfide.....	Ag_2S	247.82
Sodium.....	Na.....	22.997
Sodium Acetate.....	$NaC_2H_3O_2 \cdot 3H_2O$	136.09
“ “ anhydrous.....	$NaC_2H_3O_2$	82.04
“ Alizarinsulfonate.....	$C_{14}H_5O_2(OH)_2SO_3Na \cdot H_2O$	360.27
“ Ammonium Phosphate.....	$NaNH_4HPO_4 \cdot 4H_2O$	209.09
“ Arsenate.....	$Na_2HASO_4 \cdot 7H_2O$	312.02
“ “ anhydrous.....	Na_2HASO_4	185.91
“ Arsenite (Metarsenite).....	$NaAsO_2$	129.91
“ Benzoate.....	$NaC_7H_5O_2$	144.11
“ Bicarbonate.....	$NaHCO_3$	84.02
“ Biphosphate.....	$NaH_2PO_4 \cdot H_2O$	138.01
“ “ anhydrous.....	NaH_2PO_4	119.99
“ Bisulfite.....	$NaHSO_3$	104.07
“ Bitartrate.....	$NaHC_4H_4O_6 \cdot H_2O$	190.09
“ Borate.....	$Na_2B_4O_7 \cdot 10H_2O$	381.43
“ “ anhydrous.....	$Na_2B_4O_7$	201.27
“ Bromide.....	$NaBr$	102.91

Sodium Cacodylate	$\text{Na}(\text{CH}_3)_2\text{AsO}_2 \cdot 3\text{H}_2\text{O}$	214.02
“ “ anhydrous	$\text{Na}(\text{CH}_3)_2\text{AsO}_2$	159.98
“ Carbonate, anhydrous	Na_2CO_3	106.00
“ Carbonate Monohydrated	$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$	124.02
“ Chloride	NaCl	58.45
“ Citrate	$\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 2\text{H}_2\text{O}$	294.12
“ “ anhydrous	$\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$	258.09
“ Cobalti-Nitrite	$\text{Co}_2(\text{NO}_2)_6 \cdot 6\text{NaNO}_2 \cdot \text{H}_2\text{O}$	825.97
“ Cyanide	NaCN	49.02
“ Dichromate	$\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$	298.05
“ Diethyl-dithiocarbamate	$(\text{C}_2\text{H}_5)_2\text{N} \cdot \text{CS}_2\text{Na}$	171.26
“ Fluoride	NaF	42.00
“ Hydrosulfite	$\text{Na}_2\text{S}_2\text{O}_4$	174.11
“ Hydroxide	NaOH	40.01
“ Hypochlorite	NaClO	74.45
“ Hypophosphite	$\text{NaPH}_2\text{O}_2 \cdot \text{H}_2\text{O}$	106.01
“ “ anhydrous	NaPH_2O_2	87.99
“ Indigotindisulfonate	$\text{C}_{16}\text{H}_8\text{O}_2\text{N}_2(\text{SO}_3\text{Na})_2$	466.35
“ Iodide	NaI	149.92
“ Nitrate	NaNO_3	85.01
“ Nitrite	NaNO_2	69.01
“ Nitroprusside	$\text{Na}_2\text{Fe}(\text{NO})(\text{CN})_5 \cdot 2\text{H}_2\text{O}$	297.97
“ Oxalate	$\text{Na}_2\text{C}_2\text{O}_4$	134.01
“ Perborate	$\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$	153.88
“ “ anhydrous	NaBO_3	81.82
“ Peroxide	Na_2O_2	77.99
“ Phenolsulfonate (Sulfocarbolate)	$\text{NaC}_6\text{H}_4\text{OH} \cdot \text{SO}_3 \cdot 2\text{H}_2\text{O}$	232.19
“ “ anhydrous	$\text{NaC}_6\text{H}_4\text{OH} \cdot \text{SO}_3$	196.16
“ Phosphate, Dibasic	$\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O}$	268.09
“ “ “ anhydrous	Na_2HPO_4	141.98
“ Pyrophosphate	$\text{Na}_4\text{P}_2\text{O}_7 \cdot 10\text{H}_2\text{O}$	446.11
“ “ anhydrous	$\text{Na}_4\text{P}_2\text{O}_7$	265.95
“ Salicylate	$\text{NaC}_7\text{H}_5\text{O}_3$	160.11
“ Sulfate	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$	322.21
“ “ anhydrous	Na_2SO_4	142.05
“ Sulfide	$\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$	240.20
“ Sulfite, anhydrous	Na_2SO_3	126.05
“ Sulfocarbolate (see Sodium Phenolsulfonate)		
“ Tartrate	$\text{Na}_2\text{C}_4\text{H}_4\text{O}_6 \cdot 2\text{H}_2\text{O}$	230.10
“ “ anhydrous	$\text{Na}_2\text{C}_4\text{H}_4\text{O}_6$	194.07
“ Tetraborate (see Sodium Borate)		
“ Tetrabromofluorescein (see Eosin Y)		
“ Thiosulfate	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$	248.19
“ “ anhydrous	$\text{Na}_2\text{S}_2\text{O}_3$	158.11
“ Tungstate	$\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$	329.95
Sparteine	$\text{C}_{15}\text{H}_{26}\text{N}_2$	234.37
“ Sulfate	$\text{C}_{15}\text{H}_{26}\text{N}_2\text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$	422.53
“ “ anhydrous	$\text{C}_{15}\text{H}_{26}\text{N}_2\text{H}_2\text{SO}_4$	332.45

Stannous Chloride.....	$\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$	225.65
“ “ anhydrous.....	SnCl_2	189.61
“ Sulfide.....	SnS	150.76
Strontium.....	Sr	87.63
Strontium Bromide.....	$\text{SrBr}_2 \cdot 6\text{H}_2\text{O}$	355.56
“ Chloride.....	$\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$	266.64
“ Iodide.....	$\text{SrI}_2 \cdot 6\text{H}_2\text{O}$	449.57
“ Salicylate.....	$\text{Sr}(\text{C}_7\text{H}_5\text{O}_3)_2 \cdot 2\text{H}_2\text{O}$	397.88
“ Sulfate.....	SrSO_4	183.69
Strychnine.....	$\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2$	334.40
“ Nitrate.....	$\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2\text{HNO}_3$	397.42
“ Sulfate.....	$(\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2)_2\text{H}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$	856.96
“ “ anhydrous.....	$(\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2)_2\text{H}_2\text{SO}_4$	766.88
Sucrose (Sugar).....	$\text{C}_{12}\text{H}_{22}\text{O}_{11}$	342.30
Sugar, Cane (see Sucrose)		
Sugar, Milk (see Lactose)		
Sulfanilamide.....	$\text{C}_6\text{H}_8\text{O}_2\text{N}_2\text{S}$	172.20
Sulfapyridine.....	$\text{C}_{11}\text{H}_{11}\text{N}_3\text{O}_2\text{S}$	249.28
“ Sodium.....	$\text{C}_{11}\text{H}_{10}\text{N}_3\text{O}_2\text{SNa}$	271.27
Sulfathiazole.....	$\text{C}_9\text{H}_5\text{N}_3\text{O}_2\text{S}_2$	255.31
Sulfobromophthalein.....	$\text{C}_{20}\text{H}_{10}\text{Br}_4\text{O}_{10}\text{S}_2$	794.06
“ Sodium.....	$\text{C}_{20}\text{H}_8\text{Br}_4\text{O}_{10}\text{S}_2\text{Na}_2$	838.04
Sulfonethylmethane.....	$\text{C}_6\text{H}_{18}\text{O}_4\text{S}_2$	242.34
Sulfonmethane.....	$\text{C}_7\text{H}_{16}\text{O}_4\text{S}_2$	228.32
Sulfur.....	S	32.06
Sulfur Dioxide.....	SO_2	64.06
“ Trioxide.....	SO_3	80.06
Tantalum.....	Ta	180.88
Tellurium.....	Te	127.61
Terbium.....	Tb	159.2
Terebene.....	$\text{C}_{10}\text{H}_{16}$	136.23
Terpin Hydrate.....	$\text{C}_{10}\text{H}_{18}(\text{OH})_2 \cdot \text{H}_2\text{O}$	190.28
Tetracaine Hydrochloride.....	$\text{C}_{15}\text{H}_{24}\text{N}_2\text{O}_2 \cdot \text{HCl}$	300.82
Tetrachlorobenzoquinone (see Chloranil)		
Tetrachloroethylene.....	C_2Cl_4	165.85
Tetraiodofluorescein (see Iodeosin)		
Tetraiodophenolphthalein Sodium (see Iodophthalein Sodium)		
Tetramethylthionine Chloride (see Methylthionine Chloride)		
Thallium.....	Tl	204.39
Theobromine.....	$\text{C}_7\text{H}_8\text{N}_4\text{O}_2$	180.17
“ Sodium.....	$\text{C}_7\text{H}_7\text{N}_4\text{O}_2\text{Na}$	202.16
Theophylline.....	$\text{C}_7\text{H}_8\text{N}_4\text{O}_2 \cdot \text{H}_2\text{O}$	198.18
“ anhydrous.....	$\text{C}_7\text{H}_8\text{N}_4\text{O}_2$	180.17
Thiamine Hydrochloride.....	$\text{C}_{12}\text{H}_{17}\text{ClN}_4\text{OS} \cdot \text{HCl}$	337.27
Thiosinamine (see Allyl-thiocarbamide)		
Thorium.....	Th	232.12
Thorium Nitrate, anhydrous.....	$\text{Th}(\text{NO}_3)_4$	480.15

Thulium	Tm	169.4
Thymol	$C_{10}H_{14}O$	150.21
“ Iodide (Dithymol-diiodide).....	$(C_{10}H_{12}O)_2I_2$	550.23
Thyroxin	$C_{15}H_{11}O_4NI_4$	776.93
Tin	Sn	118.70
Titanium	Ti	47.90
Toluene (Toluol)	$C_6H_5CH_3$	92.13
o-Toluidine	$C_6H_4CH_3NH_2$	107.15
Triacetin (see Glyceryl Triacetate)		
Tribromoethanol	$C_2H_3Br_3O$	282.79
Trichloroethylene	C_2HCl_3	131.40
Trinitrophenol (Picric Acid)	$C_6H_3O_7N_3$	229.11
Trioxymethylene (see Paraformaldehyde)		
Tryparsamide	$C_8H_{10}O_4N_2AsNa \cdot \frac{1}{2}H_2O$	305.09
Tungsten	W	183.92
Uranium	U	238.07
Uranyl Acetate (Uranium Acetate)	$UO_2(C_2H_3O_2)_2 \cdot 2H_2O$	424.19
Urea (Carbamide)	$(NH_2)_2CO$	60.06
Vanadium	V	50.95
Vanillin	$C_8H_8O_3$	152.14
Water	H_2O	18.02
Xenon	Xe	131.3
Xylene (Xylol)	$C_6H_4(CH_3)_2$	106.16
Ytterbium (Neoytterbium)	Yb	173.04
Yttrium	Y	88.92
Zinc	Zn	65.38
Zinc Acetate	$Zn(C_2H_3O_2)_2 \cdot 2H_2O$	219.50
“ Chloride.....	$ZnCl_2$	136.29
“ Iodide.....	ZnI_2	319.22
“ Oxide.....	ZnO	81.38
“ Phenolsulfonate (Sulfocarbolate).....	$Zn(C_6H_4 \cdot OH \cdot SO_3)_2 \cdot 8H_2O$..	555.83
“ Sulfate.....	$ZnSO_4 \cdot 7H_2O$	287.55
“ “ anhydrous.....	$ZnSO_4$	161.44
“ Sulfocarbolate (see Zinc Phenolsulfonate)		
“ Valerate (Valerianate).....	$Zn(C_5H_9O_2)_2 \cdot 2H_2O$	303.66
Zirconium	Zr	91.22

Alcoholometric Table

Computed by the United States Bureau of Standards and based upon work done by the Bureau and published in Bureau of Standards Bulletin, Vol. 9, No. 3, pp. 424 and 425.

PERCENTAGE BY VOLUME				PERCENTAGE BY WEIGHT			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at 25° C.	Specific gravity in air at 15.56° C.	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at 25° C.	Specific gravity in air at 15.56° C.
0	0.00	1.0000	1.0000	0	0.00	1.0000	1.0000
1	0.80	0.9985	0.9985	1	1.26	0.9981	0.9981
2	1.59	0.9970	0.9970	2	2.51	0.9963	0.9963
3	2.39	0.9956	0.9956	3	3.76	0.9945	0.9945
4	3.19	0.9941	0.9942	4	5.00	0.9927	0.9928
5	4.00	0.9927	0.9928	5	6.24	0.9911	0.9912
6	4.80	0.9914	0.9915	6	7.48	0.9894	0.9896
7	5.61	0.9901	0.9902	7	8.71	0.9879	0.9881
8	6.42	0.9888	0.9890	8	9.94	0.9863	0.9867
9	7.23	0.9875	0.9878	9	11.17	0.9848	0.9852
10	8.05	0.9862	0.9866	10	12.39	0.9833	0.9839
11	8.86	0.9850	0.9854	11	13.61	0.9818	0.9825
12	9.68	0.9838	0.9843	12	14.83	0.9804	0.9812
13	10.50	0.9826	0.9832	13	16.05	0.9789	0.9799
14	11.32	0.9814	0.9821	14	17.26	0.9776	0.9787
15	12.14	0.9802	0.9810	15	18.47	0.9762	0.9774
16	12.96	0.9790	0.9800	16	19.68	0.9748	0.9763
17	13.79	0.9778	0.9789	17	20.88	0.9734	0.9751
18	14.61	0.9767	0.9779	18	22.08	0.9720	0.9738
19	15.44	0.9756	0.9769	19	23.28	0.9706	0.9726
20	16.27	0.9744	0.9759	20	24.47	0.9692	0.9714
21	17.10	0.9733	0.9749	21	25.66	0.9677	0.9701
22	17.93	0.9721	0.9739	22	26.85	0.9663	0.9688
23	18.77	0.9710	0.9729	23	28.03	0.9648	0.9675
24	19.60	0.9698	0.9719	24	29.21	0.9633	0.9662
25	20.44	0.9685	0.9708	25	30.39	0.9617	0.9648
26	21.29	0.9673	0.9697	26	31.56	0.9601	0.9635
27	22.13	0.9661	0.9687	27	32.72	0.9585	0.9620
28	22.97	0.9648	0.9676	28	33.88	0.9568	0.9605
29	23.82	0.9635	0.9664	29	35.03	0.9551	0.9590
30	24.67	0.9622	0.9653	30	36.18	0.9534	0.9574

Alcoholometric Table—*Continued*

PERCENTAGE BY VOLUME				PERCENTAGE BY WEIGHT			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at 25° C.	Specific gravity in air at 15.56° C.	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at 25° C.	Specific gravity in air at 15.56° C.
31	25.52	0.9609	0.9641	31	37.32	0.9516	0.9558
32	26.38	0.9595	0.9629	32	38.46	0.9498	0.9541
33	27.24	0.9581	0.9617	33	39.59	0.9480	0.9524
34	28.10	0.9567	0.9604	34	40.72	0.9461	0.9506
35	28.97	0.9552	0.9590	35	41.83	0.9442	0.9488
36	29.84	0.9537	0.9576	36	42.94	0.9422	0.9470
37	30.72	0.9521	0.9562	37	44.05	0.9402	0.9451
38	31.60	0.9506	0.9548	38	45.15	0.9382	0.9432
39	32.48	0.9489	0.9533	39	46.24	0.9362	0.9412
40	33.36	0.9473	0.9517	40	47.33	0.9341	0.9392
41	34.25	0.9456	0.9501	41	48.41	0.9320	0.9372
42	35.15	0.9439	0.9485	42	49.48	0.9299	0.9352
43	36.05	0.9421	0.9469	43	50.55	0.9278	0.9331
44	36.96	0.9403	0.9452	44	51.61	0.9256	0.9310
45	37.87	0.9385	0.9434	45	52.66	0.9235	0.9289
46	38.78	0.9366	0.9417	46	53.71	0.9213	0.9268
47	39.70	0.9348	0.9399	47	54.75	0.9191	0.9246
48	40.62	0.9328	0.9380	48	55.78	0.9169	0.9225
49	41.55	0.9309	0.9361	49	56.81	0.9147	0.9203
50	42.49	0.9289	0.9342	50	57.83	0.9124	0.9181
51	43.43	0.9269	0.9322	51	58.84	0.9102	0.9159
52	44.37	0.9248	0.9302	52	59.85	0.9079	0.9137
53	45.33	0.9228	0.9282	53	60.85	0.9056	0.9114
54	46.28	0.9207	0.9262	54	61.85	0.9033	0.9092
55	47.25	0.9185	0.9241	55	62.84	0.9010	0.9069
56	48.21	0.9164	0.9220	56	63.82	0.8987	0.9046
57	49.19	0.9142	0.9199	57	64.80	0.8964	0.9024
58	50.17	0.9120	0.9177	58	65.77	0.8941	0.9001
59	51.15	0.9098	0.9155	59	66.73	0.8918	0.8978
60	52.15	0.9076	0.9133	60	67.69	0.8895	0.8955
61	53.15	0.9053	0.9111	61	68.64	0.8871	0.8932
62	54.15	0.9030	0.9088	62	69.59	0.8848	0.8909
63	55.17	0.9006	0.9065	63	70.52	0.8824	0.8886
64	56.18	0.8983	0.9042	64	71.46	0.8801	0.8862
65	57.21	0.8959	0.9019	65	72.38	0.8777	0.8839
66	58.24	0.8936	0.8995	66	73.30	0.8753	0.8815
67	59.28	0.8911	0.8972	67	74.21	0.8729	0.8792
68	60.33	0.8887	0.8948	68	75.12	0.8706	0.8768
69	61.38	0.8862	0.8923	69	76.02	0.8682	0.8745
70	62.44	0.8837	0.8899	70	76.91	0.8658	0.8721

Alcoholometric Table—Continued

PERCENTAGE BY VOLUME				PERCENTAGE BY WEIGHT			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at 25° C.	Specific gravity in air at 15.56° C.	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at 25° C.	Specific gravity in air at 15.56° C.
71	63.51	0.8812	0.8874	71	77.79	0.8634	0.8697
72	64.59	0.8787	0.8848	72	78.67	0.8609	0.8673
73	65.67	0.8761	0.8823	73	79.54	0.8585	0.8649
74	66.77	0.8735	0.8797	74	80.41	0.8561	0.8625
75	67.87	0.8709	0.8771	75	81.27	0.8537	0.8601
76	68.98	0.8682	0.8745	76	82.12	0.8512	0.8576
77	70.10	0.8655	0.8718	77	82.97	0.8488	0.8552
78	71.23	0.8628	0.8691	78	83.81	0.8463	0.8528
79	72.38	0.8600	0.8664	79	84.64	0.8439	0.8503
80	73.53	0.8572	0.8636	80	85.46	0.8414	0.8479
81	74.69	0.8544	0.8608	81	86.28	0.8389	0.8454
82	75.86	0.8516	0.8580	82	87.08	0.8364	0.8429
83	77.04	0.8487	0.8551	83	87.89	0.8339	0.8404
84	78.23	0.8458	0.8522	84	88.68	0.8314	0.8379
85	79.44	0.8428	0.8493	85	89.46	0.8288	0.8354
86	80.66	0.8397	0.8462	86	90.24	0.8263	0.8328
87	81.90	0.8367	0.8432	87	91.01	0.8237	0.8303
88	83.14	0.8335	0.8401	88	91.77	0.8211	0.8276
89	84.41	0.8303	0.8369	89	92.52	0.8184	0.8250
90	85.69	0.8271	0.8336	90	93.25	0.8158	0.8224
91	86.99	0.8237	0.8303	91	93.98	0.8131	0.8197
92	88.31	0.8202	0.8268	92	94.70	0.8104	0.8170
93	89.65	0.8167	0.8233	93	95.41	0.8076	0.8142
94	91.03	0.8130	0.8196	94	96.10	0.8048	0.8114
95	92.42	0.8092	0.8158	95	96.79	0.8020	0.8086
96	93.85	0.8053	0.8118	96	97.46	0.7992	0.8057
97	95.32	0.8011	0.8077	97	98.12	0.7962	0.8028
98	96.82	0.7968	0.8033	98	98.76	0.7932	0.7988
99	98.38	0.7921	0.7986	99	99.39	0.7902	0.7967
100	100.00	0.7871	0.7936	100	100.00	0.7871	0.7936

Acid and Alkali Tables

Specific Gravity—The term “specific gravity” in the tables which follow represents the quotient obtained by dividing the weight of a volume of the liquid by the weight of an equal volume of distilled water, both measured at the same temperature and weighed in air with brass weights. The tables include specific gravity figures for 25° C., the official temperature, and also for 15° C.

Percentage—The percentage strength of hydrochloric, nitric, and sulfuric acids and of ammonia water can be calculated from their specific gravities by reference to the tables. For the determination of the percentage by the specific gravity, it is preferable to take the specific gravity at the temperature for which figures are given in the tables, at 25° or 15° C. If it is found inconvenient to determine it at these temperatures, the specific gravity may be taken at the prevailing room temperature and the correction for the specific gravity at standard temperature made from the figures in column 4 and the per cent of acid or ammonia ascertained from columns 2 (or 3) and 5 in the following manner:

Example: A sample of dilute sulfuric acid has an apparent specific gravity at 21° C. (room temperature) of 1.1457, by a pycnometer standardized at 25° C. The correction for 4° C. (subtractive) is $0.000561 \times 4 = 0.0022$ (from column 4). The corrected specific gravity, $1.1457 - 0.0022 = 1.1435$. The nearest lower figure in column 2 is 1.1400, showing (column 1) 20 per cent of acid. For the fractional per cent, multiply the difference ($1.1435 - 1.1400 = 0.0035$, taken as 35) by 0.0132 (column 5); the product is 0.462. The strength is therefore 20.462 per cent.

Normality—Column 6 shows the “normality,” i.e., the neutralizing power of the acid or alkali. If the figure in this column is 2.74, one volume of the acid diluted with water to make 2.74 volumes will be of “normal” strength. It is therefore easy by the aid of these figures to prepare volumetric solutions of approximately any desired strength $\left(\frac{N}{1}, \frac{N}{10}, \frac{N}{40}, \text{etc.}\right)$ from an acid or alkali of known percentage strength. For accurate work such solutions must of course be standardized by the usual methods. (See Volumetric Solutions, page 748.)

The chief use, however, of the normality column is for the determination directly by titration of the percentage strength of an acid or alkali of unknown specific gravity.

Example: 1 cc. (accurately measured) of a sample of acetic acid of unknown strength is found to require for neutralization 4.62 cc. of normal potassium hydroxide V.S. The nearest lower figure in column 6 is 4.465, corresponding with 26 per cent. For the fractional per cent, multiply the difference ($4.620 - 4.465 = 0.155$, taken as 15.5) by 0.0565 (column 7). The product is 0.8757. The strength is therefore 26.87+ per cent.

Acetic Acid

Per cent HC ₂ H ₃ O ₂	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.*	Fractional per cent†	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
10	1.0000	1.0000	0.00018	0.0714	0.000	0.0599
1	1.0014	1.0015	0.00019	0.0714	0.167	0.0602
2	1.0028	1.0030	0.00020	0.0714	0.333	0.0595
3	1.0042	1.0045	0.00022	0.0714	0.501	0.0599
4	1.0056	1.0060	0.00023	0.0714	0.668	0.0595
5	1.0070	1.0075	0.00024	0.0769	0.836	0.0592
6	1.0083	1.0090	0.00025	0.0714	1.005	0.0592
7	1.0097	1.0105	0.00026	0.0714	1.174	0.0588
8	1.0111	1.0120	0.00028	0.0769	1.344	0.0588
9	1.0124	1.0135	0.00029	0.0714	1.514	0.0588
10	1.0138	1.0150	0.00030	0.0769	1.684	0.0585
11	1.0151	1.0165	0.00031	0.0714	1.855	0.0585
12	1.0165	1.0179	0.00033	0.0769	2.026	0.0581
13	1.0178	1.0193	0.00034	0.0769	2.198	0.0581
14	1.0191	1.0208	0.00036	0.0769	2.370	0.0581
15	1.0204	1.0222	0.00037	0.0769	2.542	0.0578
16	1.0217	1.0236	0.00038	0.0833	2.715	0.0578
17	1.0229	1.0251	0.00040	0.0769	2.888	0.0575
18	1.0242	1.0265	0.00041	0.0833	3.062	0.0575
19	1.0254	1.0279	0.00043	0.0833	3.236	0.0571
20	1.0266	1.0293	0.00044	0.0769	3.411	0.0571
21	1.0279	1.0307	0.00045	0.0833	3.586	0.0571
22	1.0291	1.0320	0.00046	0.0833	3.761	0.0571
23	1.0303	1.0333	0.00048	0.0833	3.936	0.0568
24	1.0315	1.0346	0.00049	0.0833	4.112	0.0568
25	1.0327	1.0359	0.00050	0.0909	4.288	0.0565
26	1.0338	1.0372	0.00051	0.0833	4.465	0.0565
27	1.0350	1.0384	0.00053	0.0909	4.642	0.0565
28	1.0361	1.0397	0.00054	0.0909	4.819	0.0565
29	1.0372	1.0409	0.00055	0.0909	4.996	0.0562
30	1.0383	1.0421	0.00056	0.0909	5.174	0.0562
31	1.0394	1.0433	0.00057	0.1000	5.352	0.0562
32	1.0404	1.0445	0.00059	0.0909	5.530	0.0559
33	1.0415	1.0456	0.00060	0.1000	5.709	0.0559
34	1.0425	1.0468	0.00062	0.1000	5.888	0.0559
35	1.0435	1.0479	0.00063	0.1000	6.067	0.0559
36	1.0445	1.0490	0.00064	0.1000	6.246	0.0559
37	1.0455	1.0501	0.00065	0.1111	6.425	0.0559
38	1.0464	1.0511	0.00066	0.1000	6.604	0.0556
39	1.0474	1.0522	0.00067	0.1111	6.784	0.0556
40	1.0483	1.0532	0.00068	0.1111	6.964	0.0556

* Add if the temperature is above, subtract if it is below the standard.

† Corresponding with a difference in specific gravity of 0.0001.

‡ The figures on this line across the page are for fractional percentages below 1.

Acetic Acid—*Continued*

Per cent HC ₂ H ₃ O ₂	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.	Fractional per cent	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
41	1.0492	1.0542	0.00069	0.1111	7.144	0.0552
42	1.0501	1.0552	0.00070	0.1111	7.325	0.0552
43	1.0510	1.0561	0.00070	0.1250	7.506	0.0552
44	1.0518	1.0571	0.00071	0.1111	7.687	0.0552
45	1.0527	1.0580	0.00072	0.1250	7.868	0.0549
46	1.0535	1.0589	0.00073	0.1250	8.050	0.0552
47	1.0543	1.0598	0.00074	0.1250	8.231	0.0552
48	1.0551	1.0607	0.00075	0.1429	8.412	0.0552
49	1.0558	1.0616	0.00076	0.1250	8.593	0.0549
50	1.0566	1.0624	0.00077	0.1429	8.775	0.0552
51	1.0573	1.0632	0.00077	0.1429	8.956	0.0549
52	1.0580	1.0640	0.00078	0.1429	9.138	0.0552
53	1.0587	1.0647	0.00079	0.1667	9.319	0.0549
54	1.0593	1.0655	0.00079	0.1429	9.501	0.0549
55	1.0600	1.0662	0.00080	0.1667	9.683	0.0549
56	1.0606	1.0669	0.00081	0.1667	9.865	0.0549
57	1.0612	1.0675	0.00081	0.1667	10.047	0.0549
58	1.0618	1.0682	0.00082	0.1667	10.229	0.0549
59	1.0624	1.0688	0.00083	0.2000	10.411	0.0549
60	1.0629	1.0694	0.00084	0.2000	10.593	0.0549
61	1.0634	1.0700	0.00084	0.2000	10.775	0.0549
62	1.0639	1.0706	0.00085	0.2000	10.957	0.0552
63	1.0644	1.0711	0.00086	0.2500	11.138	0.0549
64	1.0648	1.0716	0.00086	0.2500	11.320	0.0552
65	1.0652	1.0721	0.00087	0.2500	11.501	0.0552
66	1.0656	1.0726	0.00087	0.2500	11.682	0.0549
67	1.0660	1.0730	0.00088	0.2500	11.864	0.0552
68	1.0664	1.0734	0.00089	0.2500	12.045	0.0552
69	1.0668	1.0738	0.00089	0.3333	12.226	0.0552
70	1.0671	1.0742	0.00090	0.3333	12.407	0.0556
71	1.0674	1.0746	0.00090	0.5000	12.587	0.0556
72	1.0676	1.0749	0.00091	0.5000	12.767	0.0559
73	1.0678	1.0751	0.00092	1.0000	12.946	0.0559
74	1.0679	1.0753	0.00092	1.0000	13.125	0.0559
75	1.0680	1.0755	0.00093	1.0000	13.304	0.0562
76	1.0681	1.0756	0.00093	.....	13.482	0.0562
77	1.0681	1.0757	0.00094	.....	13.660	0.0562
78	1.0681	1.0757	0.00094	.....	13.838	0.0565
79	1.0681*	1.0757	0.00095	1.0000	14.015	0.0565
80	1.0680	1.0757	0.00096	0.5000	14.192	0.0571

* Below this point the specific gravity diminishes as the strength of the acid increases.

Acetic Acid—Continued

Per cent $\text{HC}_2\text{H}_3\text{O}_2$	Sp. gr. app. $\frac{25^\circ \text{ C.}}{25^\circ \text{ C.}}$	Sp. gr. app. $\frac{15^\circ \text{ C.}}{15^\circ \text{ C.}}$	Correction of specific gravity for 1° C.	Fractional per cent	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
81	1.0678	1.0756	0.00096	0.5000	14.367	0.0571
82	1.0676	1.0755	0.00097	0.5000	14.542	0.0575
83	1.0674	1.0753	0.00097	0.3333	14.716	0.0578
84	1.0671	1.0751	0.00098	0.2500	14.889	0.0581
85	1.0667	1.0748	0.00099	0.2500	15.061	0.0585
86	1.0663	1.0745	0.00099	0.2000	15.232	0.0592
87	1.0658	1.0740	0.00100	0.1667	15.401	0.0592
88	1.0652	1.0735	0.00101	0.1667	15.570	0.0599
89	1.0646	1.0729	0.00102	0.1250	15.737	0.0602
90	1.0638	1.0722	0.00103	0.1111	15.903	0.0610
91	1.0629	1.0714	0.00103	0.1111	16.067	0.0617
92	1.0620	1.0705	0.00103	0.0833	16.229	0.0629
93	1.0608	1.0695	0.00104	0.0833	16.388	0.0637
94	1.0596	1.0683	0.00104	0.0714	16.545	0.0654
95	1.0582	1.0669	0.00105	0.0588	16.698	0.0676
96	1.0565	1.0653	0.00106	0.0526	16.846	0.0694
97	1.0546	1.0634	0.00106	0.0455	16.990	0.0709
98	1.0524	1.0613	0.00107	0.0400	17.131	0.0746
99	1.0499	1.0589	0.00108	0.0357	17.265	0.0781
100	1.0471	1.0562	0.00109	.....	17.393	.....

NOTE—If the specific gravity of the acid is greater than 1.045, mix some of the acid with an equal weight of water and take the specific gravity of the mixture, then multiply the corresponding percentage taken from the table by two. It is better, however, to determine the strength of any sample of acetic acid by its normality.

Hydrochloric Acid

Per cent HCl	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.*	Fractional per cent†	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
10	1.0000	1.0000	0.00018	0.0203	0.000	0.0362
1	1.0049	1.0050	0.00018	0.0204	0.276	0.0360
2	1.0098	1.0099	0.00019	0.0204	0.554	0.0357
3	1.0147	1.0149	0.00020	0.0205	0.834	0.0355
4	1.0196	1.0198	0.00020	0.0206	1.116	0.0352
5	1.0245	1.0247	0.00021	0.0207	1.400	0.0345
6	1.0293	1.0296	0.00022	0.0207	1.690	0.0344
7	1.0341	1.0346	0.00023	0.0208	1.981	0.0341
8	1.0389	1.0395	0.00024	0.0209	2.274	0.0339
9	1.0437	1.0444	0.00025	0.0210	2.569	0.0336
10	1.0485	1.0493	0.00027	0.0210	2.867	0.0332
11	1.0532	1.0542	0.00029	0.0211	3.168	0.0329
12	1.0580	1.0591	0.00030	0.0211	3.472	0.0327
13	1.0627	1.0640	0.00032	0.0212	3.778	0.0325
14	1.0674	1.0689	0.00034	0.0211	4.086	0.0322
15	1.0722	1.0738	0.00036	0.0211	4.397	0.0318
16	1.0769	1.0788	0.00038	0.0210	4.711	0.0316
17	1.0817	1.0837	0.00039	0.0209	5.027	0.0313
18	1.0865	1.0886	0.00041	0.0209	5.346	0.0311
19	1.0912	1.0936	0.00043	0.0209	5.668	0.0308
20	1.0960	1.0986	0.00045	0.0207	5.993	0.0306
21	1.1009	1.1036	0.00047	0.0205	6.320	0.0303
22	1.1057	1.1086	0.00049	0.0203	6.650	0.0300
23	1.1107	1.1137	0.00051	0.0202	6.983	0.0298
24	1.1156	1.1189	0.00053	0.0200	7.319	0.0295
25	1.1206	1.1241	0.00055	0.0201	7.658	0.0292
26	1.1256	1.1293	0.00057	0.0202	8.000	0.0290
27	1.1305	1.1344	0.00059	0.0203	8.345	0.0288
28	1.1355	1.1395	0.00061	0.0203	8.692	0.0287
29	1.1404	1.1446	0.00062	0.0203	9.041	0.0284
30	1.1453	1.1497	0.00064	0.0202	9.393	0.0281
31	1.1503	1.1548	0.00066	0.0203	9.749	0.0280
32	1.1552	1.1599	0.00068	0.0203	10.106	0.0278
33	1.1601	1.1650	0.00069	0.0203	10.466	0.0275
34	1.1651	1.1700	0.00070	0.0203	10.829	0.0274
35	1.1700	1.1751	0.00072	0.0209	11.194	0.0272
36	1.1748	1.1800	0.00073	0.0212	11.561	0.0271
37	1.1795	1.1848	0.00074	0.0216	11.930	0.0270
38	1.1841	1.1895	0.00075	0.0220	12.301	0.0267
39	1.1886	1.1941	0.00076	0.0221	12.675	0.0266
40	1.1931	1.1986	0.00077	.....	13.051	.....

* Add if the temperature is above, subtract if it is below, the standard.

† Corresponding with a difference in specific gravity of 0.0001.

‡ The figures on this line across the page are for fractional percentages below 1.

Nitric Acid

Per cent HNO ₃	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.*	Fractional per cent†	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
10	1.0000	1.0000	0.000180	0.0182	0.000	0.0629
1	1.0055	1.0056	0.000191	0.0185	0.159	0.0621
2	1.0109	1.0111	0.000201	0.0185	0.320	0.0617
3	1.0163	1.0165	0.000210	0.0185	0.482	0.0606
4	1.0217	1.0221	0.000215	0.0182	0.647	0.0602
5	1.0272	1.0277	0.000228	0.0182	0.813	0.0595
6	1.0327	1.0334	0.000255	0.0179	0.981	0.0588
7	1.0383	1.0392	0.000278	0.0175	1.151	0.0585
8	1.0440	1.0451	0.000299	0.0175	1.322	0.0575
9	1.0497	1.0510	0.000319	0.0172	1.496	0.0568
10	1.0555	1.0570	0.000335	0.0172	1.672	0.0568
11	1.0613	1.0630	0.000355	0.0169	1.848	0.0559
12	1.0672	1.0690	0.000374	0.0169	2.027	0.0556
13	1.0731	1.0751	0.000393	0.0169	2.207	0.0546
14	1.0790	1.0812	0.000415	0.0167	2.390	0.0543
15	1.0850	1.0874	0.000436	0.0167	2.574	0.0532
16	1.0910	1.0937	0.000455	0.0161	2.762	0.0529
17	1.0972	1.1000	0.000474	0.0161	2.951	0.0524
18	1.1034	1.1064	0.000492	0.0159	3.142	0.0518
19	1.1097	1.1128	0.000512	0.0161	3.335	0.0510
20	1.1159	1.1192	0.000530	0.0161	3.531	0.0508
21	1.1221	1.1256	0.000550	0.0159	3.728	0.0503
22	1.1284	1.1321	0.000569	0.0161	3.927	0.0495
23	1.1346	1.1385	0.000588	0.0159	4.129	0.0493
24	1.1409	1.1449	0.000604	0.0156	4.332	0.0488
25	1.1473	1.1514	0.000618	0.0156	4.537	0.0478
26	1.1537	1.1580	0.000635	0.0154	4.746	0.0476
27	1.1602	1.1647	0.000651	0.0156	4.956	0.0472
28	1.1668	1.1714	0.000666	0.0154	5.168	0.0465
29	1.1734	1.1781	0.000682	0.0154	5.383	0.0461
30	1.1800	1.1848	0.000696	0.0154	5.600	0.0459
31	1.1866	1.1916	0.000714	0.0149	5.818	0.0450
32	1.1933	1.1985	0.000727	0.0147	6.040	0.0448
33	1.2001	1.2054	0.000742	0.0149	6.263	0.0441
34	1.2068	1.2123	0.000763	0.0147	6.490	0.0439
35	1.2135	1.2191	0.000786	0.0152	6.718	0.0435
36	1.2201	1.2260	0.000810	0.0152	6.948	0.0431
37	1.2267	1.2329	0.000830	0.0149	7.180	0.0427
38	1.2334	1.2397	0.000849	0.0152	7.414	0.0424
39	1.2400	1.2464	0.000865	0.0152	7.650	0.0420
40	1.2466	1.2531	0.000879	0.0154	7.888	0.0418

* Add if the temperature is above, subtract if it is below, the standard.

† Corresponding with a difference in specific gravity of 0.0001.

‡ The figures on this line across the page are for fractional percentages below 1.

Nitric Acid—Continued

Per cent HNO ₃	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.	Fractional per cent	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
41	1.2531	1.2598	0.000895	0.0154	8.127	0.0415
42	1.2596	1.2665	0.000915	0.0156	8.368	0.0412
43	1.2660	1.2731	0.000932	0.0156	8.611	0.0408
44	1.2724	1.2797	0.000952	0.0156	8.856	0.0405
45	1.2788	1.2862	0.000973	0.0159	9.103	0.0403
46	1.2851	1.2927	0.000992	0.0161	9.351	0.0402
47	1.2913	1.2991	0.001011	0.0161	9.600	0.0397
48	1.2975	1.3055	0.001032	0.0161	9.852	0.0395
49	1.3037	1.3119	0.001053	0.0164	10.105	0.0394
50	1.3098	1.3182	0.001076	0.0169	10.359	0.0392
51	1.3157	1.3243	0.001085	0.0169	10.614	0.0389
52	1.3216	1.3304	0.001115	0.0175	10.871	0.0389
53	1.3273	1.3363	0.001134	0.0179	11.128	0.0389
54	1.3329	1.3421	0.001154	0.0182	11.385	0.0389
55	1.3384	1.3477	0.001173	0.0185	11.643	0.0386
56	1.3438	1.3533	0.001191	0.0192	11.902	0.0385
57	1.3490	1.3587	0.001211	0.0196	12.162	0.0385
58	1.3541	1.3640	0.001229	0.0200	12.422	0.0383
59	1.3591	1.3692	0.001250	0.0204	12.683	0.0383
60	1.3640	1.3742	0.001269	0.0208	12.944	0.0383
61	1.3688	1.3792	0.001287	0.0213	13.205	0.0382
62	1.3735	1.3841	0.001305	0.0213	13.467	0.0377
63	1.3782	1.3890	0.001321	0.0213	13.732	0.0376
64	1.3829	1.3938	0.001338	0.0213	13.998	0.0373
65	1.3876	1.3987	0.001352	0.0208	14.266	0.0372
66	1.3924	1.4035	0.001365	0.0213	14.535	0.0369
67	1.3971	1.4083	0.001372	0.0213	14.806	0.0369
68	1.4018	1.4131	0.001382	0.0213	15.077	0.0366
69	1.4065	1.4179	0.001389	0.0213	15.350	0.0365
70	1.4112	1.4226	0.001397	0.0213	15.624	0.0362
71	1.4159	1.4273	0.001404	0.0217	15.900	0.0361
72	1.4205	1.4320	0.001412	0.0222	16.177	0.0360
73	1.4250	1.4366	0.001419	0.0227	16.455	0.0361
74	1.4294	1.4411	0.001427	0.0233	16.732	0.0365
75	1.4336	1.4454	0.001439	0.0278	17.006	0.0372
76	1.4372	1.4491	0.001442	0.0286	17.275	0.0372
77	1.4407	1.4527	0.001454	0.0303	17.544	0.0373
78	1.4440	1.4561	0.001469	0.0323	17.812	0.0372
79	1.4471	1.4595	0.001491	0.0333	18.081	0.0373
80	1.4501	1.4627	0.001515	0.0333	18.349	0.0372
81	1.4531	1.4659	0.001542	0.0333	18.618	0.0373
82	1.4561	1.4691	0.001564	0.0345	18.886	0.0372
83	1.4590	1.4721	0.001577	0.0345	19.155	0.0372
84	1.4619	1.4751	0.001583	0.0345	19.424	0.0372
85	1.4648	1.4780	0.001580	0.0345	19.693	0.0369

Nitric Acid—*Continued*

Per cent HNO ₃	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.	Fractional per cent	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
86	1.4677	1.4809	0.001578	0.0333	19.964	0.0366
87	1.4707	1.4838	0.001573	0.0345	20.237	0.0362
88	1.4736	1.4867	0.001569	0.0345	20.513	0.0364
89	1.4765	1.4895	0.001562	0.0333	20.788	0.0368
90	1.4795	1.4924	0.001553	0.0400	21.060	0.0377
91	1.4819	1.4949	0.001564	0.0435	21.325	0.0377
92	1.4842	1.4973	0.001575	0.0500	21.590	0.0377
93	1.4862	1.4994	0.001586	0.0526	21.855	0.0377
94	1.4881	1.5015	0.001597	0.0556	22.120	0.0377
95	1.4899	1.5033	0.001608	0.0588	22.385	0.0350
96	1.4916	1.5053	0.001631	0.0357	22.671	0.0344
97	1.4944	1.5083	0.001658	0.0270	22.962	0.0340
98	1.4981	1.5123	0.001683	0.0217	23.256	0.0336
99	1.5027	1.5171	0.001708	0.0175	23.554	0.0330
100	1.5084	1.5230	0.001732	.....	23.857	.....

Sulfuric Acid

Per cent H ₂ SO ₄	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.*	Fractional per cent †	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
10	1.0000	1.0000	0.000180	0.0147	0.000	0.0488
1	1.0068	1.0070	0.000200	0.0152	0.205	0.0483
2	1.0134	1.0139	0.000221	0.0154	0.412	0.0476
3	1.0199	1.0206	0.000241	0.0152	0.622	0.0469
4	1.0265	1.0274	0.000262	0.0152	0.835	0.0465
5	1.0331	1.0342	0.000282	0.0149	1.050	0.0459
6	1.0398	1.0411	0.000302	0.0147	1.268	0.0452
7	1.0466	1.0480	0.000323	0.0147	1.489	0.0446
8	1.0534	1.0550	0.000343	0.0145	1.713	0.0441
9	1.0603	1.0621	0.000363	0.0145	1.940	0.0437
10	1.0672	1.0692	0.000384	0.0143	2.169	0.0429
11	1.0742	1.0764	0.000404	0.0143	2.402	0.0424
12	1.0812	1.0836	0.000424	0.0139	2.638	0.0420
13	1.0884	1.0909	0.000444	0.0141	2.876	0.0413
14	1.0955	1.0983	0.000464	0.0139	3.118	0.0410
15	1.1027	1.1057	0.000484	0.0135	3.362	0.0403
16	1.1101	1.1132	0.000500	0.0135	3.610	0.0398
17	1.1175	1.1207	0.000516	0.0135	3.861	0.0392
18	1.1249	1.1283	0.000531	0.0133	4.116	0.0388
19	1.1324	1.1360	0.000546	0.0132	4.374	0.0385
20	1.1400	1.1437	0.000561	0.0132	4.634	0.0377
21	1.1476	1.1515	0.000574	0.0130	4.898	0.0375
22	1.1553	1.1593	0.000586	0.0128	5.166	0.0368
23	1.1631	1.1671	0.000599	0.0128	5.438	0.0365
24	1.1709	1.1750	0.000611	0.0128	5.712	0.0360
25	1.1787	1.1830	0.000623	0.0127	5.990	0.0356
26	1.1866	1.1910	0.000633	0.0127	6.271	0.0351
27	1.1946	1.1991	0.000642	0.0125	6.556	0.0347
28	1.2026	1.2072	0.000651	0.0123	6.844	0.0342
29	1.2107	1.2153	0.000661	0.0123	7.136	0.0338
30	1.2188	1.2235	0.000670	0.0122	7.432	0.0334
31	1.2270	1.2318	0.000676	0.0122	7.731	0.0330
32	1.2352	1.2401	0.000682	0.0120	8.034	0.0327
33	1.2435	1.2484	0.000688	0.0119	8.340	0.0322
34	1.2519	1.2568	0.000694	0.0119	8.651	0.0318
35	1.2603	1.2653	0.000699	0.0118	8.965	0.0314
36	1.2688	1.2738	0.000702	0.0118	9.283	0.0311
37	1.2773	1.2823	0.000704	0.0116	9.605	0.0307
38	1.2859	1.2909	0.000707	0.0116	9.931	0.0303
39	1.2945	1.2996	0.000709	0.0115	10.261	0.0299
40	1.3032	1.3082	0.000712	0.0114	10.595	0.0296

* Add if the temperature is above, subtract if it is below, the standard.

† Corresponding with a difference in specific gravity of 0.0001.

‡ The figures in this line across the page are for fractional percentages below 1.

Sulfuric Acid—Continued

Per cent H ₂ SO ₄	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.	Fractional per cent	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
41	1.3120	1.3171	0.000715	0.0112	10.933	0.0292
42	1.3209	1.3260	0.000717	0.0111	11.276	0.0288
43	1.3299	1.3350	0.000720	0.0110	11.623	0.0285
44	1.3390	1.3441	0.000723	0.0110	11.974	0.0281
45	1.3481	1.3533	0.000726	0.0108	12.330	0.0278
46	1.3574	1.3626	0.000731	0.0108	12.690	0.0273
47	1.3667	1.3721	0.000736	0.0105	13.056	0.0270
48	1.3762	1.3816	0.000741	0.0103	13.426	0.0266
49	1.3859	1.3913	0.000747	0.0103	13.802	0.0263
50	1.3956	1.4011	0.000753	0.0102	14.182	0.0260
51	1.4054	1.4110	0.000759	0.0100	14.567	0.0256
52	1.4154	1.4210	0.000765	0.0100	14.958	0.0253
53	1.4254	1.4311	0.000771	0.0098	15.354	0.0249
54	1.4356	1.4413	0.000777	0.0097	15.755	0.0246
55	1.4459	1.4516	0.000784	0.0096	16.162	0.0243
56	1.4563	1.4621	0.000790	0.0095	16.574	0.0239
57	1.4668	1.4726	0.000795	0.0094	16.992	0.0236
58	1.4774	1.4832	0.000800	0.0093	17.415	0.0234
59	1.4881	1.4939	0.000805	0.0093	17.843	0.0230
60	1.4989	1.5048	0.000810	0.0092	18.277	0.0228
61	1.5098	1.5157	0.000816	0.0091	18.716	0.0225
62	1.5208	1.5267	0.000822	0.0091	19.161	0.0222
63	1.5318	1.5379	0.000828	0.0090	19.612	0.0219
64	1.5429	1.5491	0.000834	0.0089	20.068	0.0217
65	1.5541	1.5603	0.000841	0.0088	20.529	0.0214
66	1.5654	1.5717	0.000848	0.0088	20.996	0.0211
67	1.5768	1.5831	0.000856	0.0088	21.469	0.0209
68	1.5882	1.5946	0.000864	0.0087	21.947	0.0207
69	1.5997	1.6062	0.000872	0.0087	22.431	0.0204
70	1.6112	1.6178	0.000880	0.0085	22.920	0.0202
71	1.6229	1.6295	0.000888	0.0085	23.416	0.0200
72	1.6346	1.6413	0.000897	0.0085	23.917	0.0197
73	1.6464	1.6531	0.000906	0.0085	24.424	0.0196
74	1.6582	1.6650	0.000915	0.0085	24.935	0.0193
75	1.6700	1.6769	0.000924	0.0085	25.452	0.0192
76	1.6817	1.6888	0.000934	0.0085	25.972	0.0190
77	1.6935	1.7006	0.000947	0.0086	26.498	0.0189
78	1.7051	1.7124	0.000963	0.0087	27.027	0.0188
79	1.7166	1.7240	0.000976	0.0088	27.558	0.0188
80	1.7279	1.7355	0.000987	0.0090	28.090	0.0187
81	1.7390	1.7467	0.000999	0.0093	28.624	0.0188
82	1.7497	1.7575	0.001011	0.0096	29.156	0.0188
83	1.7601	1.7680	0.001022	0.0101	29.687	0.0190
84	1.7700	1.7780	0.001034	0.0109	30.213	0.0193
85	1.7792	1.7873	0.001046	0.0115	30.732	0.0195

Sulfuric Acid—*Continued*

Per cent H ₂ SO ₄	Sp. gr. app. 25° C.	Sp. gr. app. 15° C.	Correction of specific gravity for 1° C.	Fractional per cent	Normality. 1 cc. requires normal NaOH cc.	Per cent = 0.01 cc. normal NaOH
86	1.7879	1.7959	0.001043	0.0127	31.244	0.0199
87	1.7958	1.8038	0.001040	0.0139	31.747	0.0203
88	1.8030	1.8110	0.001035	0.0154	32.240	0.0207
89	1.8095	1.8174	0.001030	0.0172	32.724	0.0211
90	1.8153	1.8231	0.001022	0.0196	33.198	0.0216
91	1.8204	1.8282	0.001032	0.0217	33.662	0.0220
92	1.8250	1.8327	0.001043	0.0256	34.116	0.0225
93	1.8289	1.8365	0.001053	0.0303	34.561	0.0230
94	1.8322	1.8397	0.001064	0.0385	34.995	0.0235
95	1.8348	1.8422	0.001074	0.0526	35.420	0.0244
96	1.8367	1.8440	0.001064	0.1111	35.830	0.0256
97	1.8376	1.8448	0.001054	....	36.221	0.0274
98	1.8372	1.8445	0.001064	0.0555	36.586	0.0297
99	1.8354	1.8427	0.001070	0.0270	36.923	0.0336
100	1.8317	1.8391	0.001074	....	37.221	....

Note that the specific gravity diminishes in acids of more than 97.5 per cent strength as the percentage increases.

Ammonia Water

Per cent NH ₃	Sp. gr. app. 25° C. 25° C.	Sp. gr. app. 15° C. 15° C.	Correction of specific gravity for 1° C.*	Fractional per cent†	Normality. 1 cc. requires normal HCl cc.	Per cent = 0.01 cc. normal HCl
10	1.00000	1.00000	0.00017	0.0227	0.000	0.0172
1	0.99560	0.99573	0.00018	0.0230	0.583	0.0173
2	0.99126	0.99151	0.00020	0.0233	1.160	0.0175
3	0.98696	0.98735	0.00021	0.0236	1.733	0.0176
4	0.98272	0.98324	0.00023	0.0239	2.301	0.0178
5	0.97854	0.97918	0.00024	0.0240	2.864	0.0179
6	0.97437	0.97517	0.00026	0.0243	3.422	0.0181
7	0.97025	0.97121	0.00028	0.0246	3.976	0.0182
8	0.96618	0.96730	0.00029	0.0249	4.525	0.0184
9	0.96216	0.96344	0.00030	0.0252	5.069	0.0185
10	0.95819	0.95964	0.00032	0.0267	5.609	0.0186
11	0.95445	0.95604	0.00033	0.0270	6.146	0.0188
12	0.95074	0.95249	0.00035	0.0273	6.679	0.0189
13	0.94708	0.94898	0.00036	0.0276	7.207	0.0190
14	0.94346	0.94551	0.00037	0.0279	7.732	0.0192
15	0.93987	0.94208	0.00039	0.0282	8.253	0.0193
16	0.93633	0.93869	0.00040	0.0286	8.770	0.0195
17	0.93283	0.93533	0.00042	0.0289	9.283	0.0196
18	0.92937	0.93202	0.00043	0.0292	9.793	0.0198
19	0.92594	0.92874	0.00045	0.0295	10.299	0.0199
20	0.92255	0.92550	0.00046	0.0295	10.801	0.0200
21	0.91916	0.92230	0.00047	0.0299	11.300	0.0202
22	0.91581	0.91914	0.00049	0.0301	11.796	0.0204
23	0.91249	0.91601	0.00050	0.0307	12.287	0.0205
24	0.90923	0.91292	0.00052	0.0309	12.776	0.0206
25	0.90599	0.90987	0.00053	0.0317	13.262	0.0207
26	0.90286	0.90685	0.00055	0.0321	13.744	0.0209
27	0.89974	0.90385	0.00057	0.0324	14.223	0.0210
28	0.89665	0.90087	0.00058	0.0326	14.699	0.0212
29	0.89358	0.89791	0.00059	0.0329	15.171	0.0213
30	0.89054	0.89498	0.00060	0.0339	15.640	0.0214
31	0.88759	0.89212	0.00061	0.0353	16.108	0.0214
32	0.88476	0.88938	0.00062	0.0368	16.575	0.0215
33	0.88204	0.88674	0.00063	0.0382	17.040	0.0215
34	0.87942	0.88421	0.00064	0.0394	17.505	0.0216
35	0.87688	0.88176	0.00064	....	17.968	....

* Add if the temperature is above, subtract if it is below, the standard.

† Corresponding with a difference in specific gravity of 0.0001.

‡ The figures in this line across the page are for fractional percentages below 1.

Thermometric Equivalents

Centigrade to Fahrenheit Scales

$$\frac{9}{5} \text{C. } ^\circ + 32 = \text{F. } ^\circ$$

C. °	F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °	F. °
-20	-4.0	21	69.8	61	141.8	101	213.8	141	285.8
-19	-2.2	22	71.6	62	143.6	102	215.6	142	287.6
-18	-0.4	23	73.4	63	145.4	103	217.4	143	289.4
-17	1.4	24	75.2	64	147.2	104	219.2	144	291.2
-16	3.2	25	77.	65	149.	105	221.	145	293.
-15	5.	26	78.8	66	150.8	106	222.8	146	294.8
-14	6.8	27	80.6	67	152.6	107	224.6	147	296.6
-13	8.6	28	82.4	68	154.4	108	226.4	148	298.4
-12	10.4	29	84.2	69	156.2	109	228.2	149	300.2
-11	12.2	30	86.	70	158.	110	230.	150	302.
-10	14.	31	87.8	71	159.8	111	231.8	151	303.8
-9	15.8	32	89.6	72	161.6	112	233.6	152	305.6
-8	17.6	33	91.4	73	163.4	113	235.4	153	307.4
-7	19.4	34	93.2	74	165.2	114	237.2	154	309.2
-6	21.2	35	95.	75	167.	115	239.	155	311.
-5	23.	36	96.8	76	168.8	116	240.8	156	312.8
-4	24.8	37	98.6	77	170.6	117	242.6	157	314.6
-3	26.6	38	100.4	78	172.4	118	244.4	158	316.4
-2	28.4	39	102.2	79	174.2	119	246.2	159	318.2
-1	30.2	40	104.	80	176.	120	248.	160	320.
0	32.	41	105.8	81	177.8	121	249.8	161	321.8
1	33.8	42	107.6	82	179.6	122	251.6	162	323.6
2	35.6	43	109.4	83	181.4	123	253.4	163	325.4
3	37.4	44	111.2	84	183.2	124	255.2	164	327.2
4	39.2	45	113.	85	185.	125	257.	165	329.
5	41.	46	114.8	86	186.8	126	258.8	166	330.8
6	42.8	47	116.6	87	188.6	127	260.6	167	332.6
7	44.6	48	118.4	88	190.4	128	262.4	168	334.4
8	46.4	49	120.2	89	192.2	129	264.2	169	336.2
9	48.2	50	122.	90	194.	130	266.	170	338.
10	50.	51	123.8	91	195.8	131	267.8	171	339.8
11	51.8	52	125.6	92	197.6	132	269.6	172	341.6
12	53.6	53	127.4	93	199.4	133	271.4	173	343.4
13	55.4	54	129.2	94	201.2	134	273.2	174	345.2
14	57.2	55	131.	95	203.	135	275.	175	347.
15	59.	56	132.8	96	204.8	136	276.8	176	348.8
16	60.8	57	134.6	97	206.6	137	278.6	177	350.6
17	62.6	58	136.4	98	208.4	138	280.4	178	352.4
18	64.4	59	138.2	99	210.2	139	282.2	179	354.2
19	66.2	60	140.	100	212.	140	284.	180	356.
20	68.								

Thermometric Equivalents—*Continued*

Fahrenheit to Centigrade Scales

$$(F. ^\circ - 32) \times \frac{5}{9} = C. ^\circ$$

F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °
0	-17.78	51	10.56	101	38.33	151	66.11	201	93.89
1	-17.22	52	11.11	102	38.89	152	66.67	202	94.44
2	-16.67	53	11.67	103	39.44	153	67.22	203	95.
3	-16.11	54	12.22	104	40.	154	67.78	204	95.56
4	-15.56	55	12.78	105	40.56	155	68.33	205	96.11
5	-15.	56	13.33	106	41.11	156	68.89	206	96.67
6	-14.44	57	13.89	107	41.67	157	69.44	207	97.22
7	-13.89	58	14.44	108	42.22	158	70.	208	97.78
8	-13.33	59	15.	109	42.78	159	70.56	209	98.33
9	-12.78	60	15.56	110	43.33	160	71.11	210	98.89
10	-12.22	61	16.11	111	43.89	161	71.67	211	99.44
11	-11.67	62	16.67	112	44.44	162	72.22	212	100.
12	-11.11	63	17.22	113	45.	163	72.78	213	100.56
13	-10.56	64	17.78	114	45.56	164	73.33	214	101.11
14	-10.	65	18.33	115	46.11	165	73.89	215	101.67
15	-9.44	66	18.89	116	46.67	166	74.44	216	102.22
16	-8.89	67	19.44	117	47.22	167	75.	217	102.78
17	-8.33	68	20.	118	47.78	168	75.56	218	103.33
18	-7.78	69	20.56	119	48.33	169	76.11	219	103.89
19	-7.22	70	21.11	120	48.89	170	76.67	220	104.44
20	-6.67	71	21.67	121	49.44	171	77.22	221	105.
21	-6.11	72	22.22	122	50.	172	77.78	222	105.56
22	-5.56	73	22.78	123	50.56	173	78.33	223	106.11
23	-5.	74	23.33	124	51.11	174	78.89	224	106.67
24	-4.44	75	23.89	125	51.67	175	79.44	225	107.22
25	-3.89	76	24.44	126	52.22	176	80.	226	107.78
26	-3.33	77	25.	127	52.78	177	80.56	227	108.33
27	-2.78	78	25.56	128	53.33	178	81.11	228	108.89
28	-2.22	79	26.11	129	53.89	179	81.67	229	109.44
29	-1.67	80	26.67	130	54.44	180	82.22	230	110.
30	-1.11	81	27.22	131	55.	181	82.78	231	110.56
31	-0.56	82	27.78	132	55.56	182	83.33	232	111.11
32	0.	83	28.33	133	56.11	183	83.89	233	111.67
33	0.56	84	28.89	134	56.67	184	84.44	234	112.22
34	1.11	85	29.44	135	57.22	185	85.	235	112.78
35	1.67	86	30.	136	57.78	186	85.56	236	113.33
36	2.22	87	30.56	137	58.33	187	86.11	237	113.89
37	2.78	88	31.11	138	58.89	188	86.67	238	114.44
38	3.33	89	31.67	139	59.44	189	87.22	239	115.
39	3.89	90	32.22	140	60.	190	87.78	240	115.56
40	4.44	91	32.78	141	60.56	191	88.33	241	116.11
41	5.	92	33.33	142	61.11	192	88.89	242	116.67
42	5.56	93	33.89	143	61.67	193	89.44	243	117.22
43	6.11	94	34.44	144	62.22	194	90.	244	117.78
44	6.67	95	35.	145	62.78	195	90.56	245	118.33
45	7.22	96	35.56	146	63.33	196	91.11	246	118.89
46	7.78	97	36.11	147	63.89	197	91.67	247	119.44
47	8.33	98	36.67	148	64.44	198	92.22	248	120.
48	8.89	99	37.22	149	65.	199	92.78	249	120.56
49	9.44	100	37.78	150	65.56	200	93.33	250	121.11
50	10.								

Reduction of Apparent to True Specific Gravity

viz.: $\frac{25^{\circ} \text{ C.}}{25^{\circ} \text{ C.}}$ in air to $\frac{25^{\circ} \text{ C.}}{25^{\circ} \text{ C.}}$ in vacuum

Weights of Brass, Sp. gr. 8.4. Barometer 760 mm.

Sp. gr. Apparent	Correction	Sp. gr. Apparent	Correction
0.6	+0.000471	1	0.000000
0.7	+0.000353	2	-0.001177
0.8	+0.000235	3	-0.002355
0.9	+0.000118	4	-0.003532
1.0	0.000000	5	-0.004709
1.1	-0.000118	6	-0.005887
1.2	-0.000235	7	-0.007064
1.3	-0.000353	8	-0.008241
1.4	-0.000471	9	-0.009418
1.5	-0.000589	10	-0.010596
1.6	-0.000706	11	-0.011773
1.7	-0.000824	12	-0.012950
1.8	-0.000942	13	-0.014128
1.9	-0.001060	14	-0.015305
2.0	-0.001177	15	-0.016482

Formula for deriving above correction: Subtract algebraically the apparent specific gravity from 1.000 and multiply the remainder by 0.0011773. It is additive for specific gravities below, subtractive for those above, 1.000.

NOTE—The correction for reducing true to apparent specific gravity is found by subtracting algebraically 1.000 from the true specific gravity and multiplying the remainder by the factor 0.0011765. It is subtractive for specific gravities below, additive for those above, 1.000.

Calibration of Pycnometers

Apparent Weight in Air of Distilled Water Filling "100 Gm." Pycnometer at Various Temperatures

Barometer 760 mm.† Coefficient of Expansion of Glass 0.000025. Air $\frac{1}{2}$ saturated.

Tem- pera- ture of water.* ° C.	Basis 15° C. 4° C. in vacuo. (Den- sity) 100 cc. Wt. in air	Basis 20° C. 4° C. in vacuo. 100 cc. Wt. in air	Basis 15° C. 15° C. in vacuo. Wt. in air	Basis 20° C. 20° C. in vacuo. Wt. in air	Basis 25° C. 25° C. in vacuo. Wt. in air	Basis 15° C. 15° C. in air. Wt. in air	Basis 15.56° C. 15.56° C. in air. (Alcohol Standard) Wt. in air	Basis 20° C. 20° C. in air. Wt. in air	Basis 25° C. 25° C. in air. (Official) Wt. in air
15° C.	99.8050	99.7925	99.8923	99.9690	100.0726	100.0000	100.0070	100.0750	100.1768
16° C.	99.7923	99.7798	99.8795	99.9563	100.0598	99.9873	99.9943	100.0622	100.1640
17° C.	99.7784	99.7659	99.8656	99.9424	100.0459	99.9734	99.9804	100.0483	100.1501
18° C.	99.7634	99.7510	99.8506	99.9274	100.0309	99.9584	99.9654	100.0333	100.1351
19° C.	99.7474	99.7349	99.8345	99.9113	100.0148	99.9423	99.9493	100.0172	100.1189
20° C.	99.7302	99.7177	99.8194	99.8941	99.9975	99.9251	99.9321	100.0000	100.1017
21° C.	99.7120	99.6995	99.7991	99.8759	99.9793	99.9068	99.9138	99.9817	100.0834
22° C.	99.6927	99.6802	99.7798	99.8565	99.9600	99.8874	99.8944	99.9623	100.0641
23° C.	99.6724	99.6599	99.7595	99.8362	99.9396	99.8671	99.8741	99.9420	100.0437
24° C.	99.6511	99.6386	99.7382	99.8149	99.9183	99.8458	99.8528	99.9207	100.0224
25° C.	99.6288	99.6164	99.7159	99.7926	99.8959	99.8235	99.8305	99.8983	100.0000
26° C.	99.6056	99.5931	99.6926	99.7693	99.8726	99.8003	99.8173	99.8750	99.9767
27° C.	99.5813	99.5689	99.6684	99.7450	99.8483	99.7761	99.7831	99.8507	99.9524
28° C.	99.5562	99.5438	99.6432	99.7199	99.8231	99.7509	99.7579	99.8255	99.9271
29° C.	99.5302	99.5177	99.6172	99.6937	99.7970	99.7247	99.7317	99.7994	99.9010
30° C.	99.5032	99.4908	99.5902	99.6667	99.7700	99.6976	99.7046	99.7724	99.8739
31° C.	99.4754	99.4630	99.5623	99.6388	99.7421	99.6697	99.6767	99.7445	99.8460
32° C.	99.4467	99.4343	99.5336	99.6102	99.7133	99.6410	99.6480	99.7157	99.8172
33° C.	99.4172	99.4048	99.5041	99.5806	99.6837	99.6114	99.6184	99.6861	99.7876
34° C.	99.3868	99.3744	99.4737	99.5502	99.6533	99.5810	99.5880	99.6557	99.7572
35° C.	99.3557	99.3433	99.4425	99.5190	99.6221	99.5498	99.5568	99.6245	99.7259

* If temperature of air is above that of the water, add for each degree centigrade 0.00041; if below, subtract the same amount.

† If barometer (corrected for temperature) is above 760 mm., subtract for each 10 mm. 0.0014; if below, add the same amount (see page 812, column 5).

NOTE—When extreme exactness is required, the counterpoise of the flask should be of the same kind of glass as that of which the flask is made.

Calibration of Glass Measuring Apparatus

Apparent weight in air of distilled water filling a 100-cc. flask at different temperatures. Barometer (corrected for temperature) 760 mm. Coefficient of cubical expansion of glass taken as 0.000025. It is assumed that the weights used are brass and that water and air (one-half saturated with moisture) are at the same temperature.

Temperature*	Flask holds 100 cc. at 15° C.	Flask holds 100 cc. at 20° C.	Flask holds 100 cc. at 25° C. U. S. P. Standard	Correction for 10 mm. Barometer above or below 760 mm. †
15° C.	99.8050	99.7925	99.7801	0.00142
16° C.	99.7923	99.7798	99.7673	0.00141
17° C.	99.7784	99.7659	99.7535	0.00141
18° C.	99.7634	99.7510	99.7385	0.00140
19° C.	99.7474	99.7349	99.7224	0.00140
20° C.	99.7302	99.7177	99.7052	0.00140
21° C.	99.7120	99.6995	99.6870	0.00139
22° C.	99.6927	99.6802	99.6678	0.00139
23° C.	99.6724	99.6599	99.6475	0.00138
24° C.	99.6511	99.6386	99.6262	0.00138
25° C.	99.6288	99.6164	99.6039	0.00137
26° C.	99.6056	99.5931	99.5807	0.00137
27° C.	99.5813	99.5689	99.5564	0.00136
28° C.	99.5562	99.5438	99.5313	0.00136
29° C.	99.5302	99.5177	99.5053	0.00136
30° C.	99.5032	99.4908	99.4783	0.00135
31° C.	99.4754	99.4630	99.4505	0.00135
32° C.	99.4467	99.4343	99.4218	0.00134
33° C.	99.4172	99.4048	99.3924	0.00134
34° C.	99.3868	99.3744	99.3620	0.00133
35° C.	99.3557	99.3433	99.3309	0.00133

* If temperature of air is above that of the water, add for each degree centigrade, 0.00041; if below, subtract the same amount.

† Barometer correction additive if reading is below 760 mm., subtractive if above.

NOTE—When extreme exactness is required the counterpoise of the flask should be of the same kind of glass as that of which the flask is made.

Weight and Volume Relations

Specific gravity true 25° C.	Specific volume	Weight of 1 U. S. gallon in pounds avoirdupois in air	Weight of 100 fluid-ounces in ounces avoirdupois	Weight of 1 fluid-ounce in grains	Volume in U. S. gallons of 100 lbs. avoirdupois	Volume in fluid-ounces of 100 oss. avoirdupois	Volume in fluid-ounces of 1000 grains
0.70	1.4286	5.816	72.70	318.0	17.195	137.56	3.144
0.71	1.4085	5.899	73.74	322.6	16.953	135.62	3.100
0.72	1.3889	5.982	74.78	327.1	16.717	133.73	3.057
0.73	1.3699	6.065	75.82	331.7	16.487	131.90	3.015
0.74	1.3514	6.149	76.86	336.2	16.264	130.11	2.974
0.75	1.3333	6.232	77.90	340.8	16.047	128.38	2.934
0.76	1.3158	6.315	78.94	345.3	15.836	126.69	2.896
0.77	1.2987	6.398	79.98	349.9	15.630	125.04	2.858
0.78	1.2821	6.481	81.02	354.5	15.429	123.43	2.821
0.79	1.2658	6.565	82.06	359.0	15.233	121.87	2.786
0.80	1.2500	6.648	83.10	363.6	15.043	120.34	2.751
0.81	1.2346	6.731	84.14	368.1	14.857	118.85	2.717
0.82	1.2195	6.814	85.18	372.7	14.675	117.40	2.684
0.83	1.2048	6.897	86.22	377.2	14.496	115.99	2.651
0.84	1.1905	6.981	87.26	381.8	14.325	114.60	2.620
0.85	1.1765	7.064	88.30	386.3	14.157	113.25	2.589
0.86	1.1628	7.147	89.34	390.9	13.992	111.93	2.559
0.87	1.1494	7.230	90.38	395.4	13.831	110.65	2.529
0.88	1.1364	7.314	91.42	400.0	13.673	109.39	2.500
0.89	1.1236	7.397	92.46	404.5	13.520	108.16	2.472
0.90	1.1111	7.480	93.50	409.1	13.369	106.95	2.445
0.91	1.0989	7.563	94.54	413.6	13.222	105.78	2.418
0.92	1.0870	7.646	95.58	418.2	13.078	104.62	2.391
0.93	1.0753	7.730	96.62	422.7	12.937	103.50	2.366
0.94	1.0638	7.813	97.66	427.3	12.799	102.40	2.341
0.95	1.0526	7.896	98.70	431.8	12.666	101.32	2.316
0.96	1.0417	7.979	99.74	436.4	12.532	100.26	2.292
0.97	1.0309	8.063	100.78	440.9	12.403	99.23	2.268
0.98	1.0204	8.146	101.82	445.5	12.276	98.21	2.245
0.99	1.0101	8.229	102.86	450.0	12.152	97.22	2.222
1.00	1.0000	8.312	103.90	454.6	12.031	96.24	2.200
1.02	0.9804	8.479	105.98	463.7	11.794	94.36	2.157
1.04	0.9615	8.645	108.06	472.8	11.567	92.54	2.115
1.06	0.9434	8.812	110.14	481.9	11.349	90.79	2.075
1.08	0.9259	8.978	112.22	491.0	11.138	89.11	2.037
1.10	0.9091	9.144	114.31	500.1	10.936	87.49	2.000
1.12	0.8929	9.311	116.39	509.2	10.740	85.92	1.964
1.14	0.8772	9.477	118.47	518.3	10.552	84.41	1.929
1.16	0.8621	9.644	120.55	527.4	10.370	82.96	1.896
1.18	0.8475	9.810	122.63	536.5	10.194	81.55	1.864

Weight and Volume Relations—Continued

Specific gravity true 25° C. 25° C.	Specific volume	Weight of 1 U. S. gallon in pounds avoirdupois in air	Weight of 100 fluid-ounces in ounces avoirdupois	Weight of 1 fluid-ounce in grains	Volume in U. S. gallons of 100 lbs. avoirdupois	Volume in fluidounces of 100 ozs. avoirdupois	Volume in fluid-ounces of 1000 grains
1.20	0.8333	9.977	124.71	545.6	10.024	80.19	1.833
1.22	0.8197	10.143	126.79	554.7	9.859	78.87	1.803
1.24	0.8065	10.309	128.87	563.8	9.700	77.60	1.774
1.26	0.7937	10.476	130.95	572.9	9.546	76.37	1.746
1.28	0.7813	10.642	133.03	582.0	9.396	75.17	1.718
1.30	0.7692	10.809	135.11	591.1	9.252	74.01	1.692
1.32	0.7576	10.975	137.19	600.2	9.111	72.89	1.666
1.34	0.7463	11.142	139.27	609.3	8.975	71.80	1.641
1.36	0.7353	11.308	141.35	618.4	8.843	70.75	1.617
1.38	0.7246	11.475	143.43	627.5	8.715	69.72	1.594
1.40	0.7143	11.641	145.51	636.6	8.590	68.72	1.571
1.42	0.7042	11.807	147.59	645.7	8.469	67.75	1.549
1.44	0.6944	11.974	149.67	654.8	8.352	66.81	1.527
1.46	0.6849	12.140	151.75	663.9	8.237	65.90	1.506
1.48	0.6757	12.307	153.83	673.0	8.126	65.01	1.486
1.50	0.6667	12.473	155.92	682.1	8.017	64.13	1.466
1.52	0.6579	12.640	158.00	691.2	7.912	63.29	1.447
1.54	0.6494	12.806	160.08	700.3	7.809	62.47	1.428
1.56	0.6410	12.973	162.16	709.4	7.709	61.67	1.410
1.58	0.6329	13.133	164.24	718.5	7.611	60.89	1.392
1.60	0.6250	13.305	166.32	727.6	7.516	60.13	1.374
1.62	0.6173	13.472	168.40	736.7	7.423	59.38	1.357
1.64	0.6098	13.638	170.48	745.8	7.332	58.66	1.341
1.66	0.6024	13.805	172.56	754.9	7.244	57.95	1.325
1.68	0.5952	13.971	174.64	764.1	7.158	57.26	1.309
1.70	0.5882	14.138	176.72	773.2	7.073	56.59	1.293
1.72	0.5814	14.304	178.80	782.3	6.991	55.93	1.278
1.74	0.5747	14.470	180.88	791.4	6.911	55.29	1.264
1.76	0.5682	14.637	182.96	800.5	6.832	54.66	1.249
1.78	0.5618	14.803	185.04	809.6	6.755	54.04	1.235
1.80	0.5556	14.970	187.12	818.7	6.680	53.44	1.222
1.82	0.5495	15.136	189.20	827.8	6.607	52.85	1.208
1.84	0.5435	15.302	191.28	836.9	6.535	52.28	1.195
1.86	0.5376	15.469	193.36	846.0	6.465	51.72	1.182
1.88	0.5319	15.636	195.44	855.1	6.396	51.17	1.170
1.90	0.5263	15.802	197.53	864.2	6.328	50.63	1.157
1.92	0.5208	15.968	199.61	873.3	6.262	50.10	1.145
1.94	0.5155	16.135	201.69	882.4	6.198	49.58	1.133
1.96	0.5102	16.301	203.77	891.5	6.135	49.08	1.122
1.98	0.5051	16.468	205.85	900.6	6.073	48.58	1.110
2.00	0.5000	16.634	207.93	909.7	6.012	48.09	1.100

Equivalents of Weights and Measures

Metric, Avoirdupois and Apothecaries

NOTE—The values, given for the relation of weight to measure and *vice versa*, are for water at the temperature of 4° C. (39.2° F.) *in vacuo*. For ordinary, practical purposes these values may be used without correction.

Weights			Metric Weight and Measure Gm. or cc.*	Measures		
Grains	Apothecaries ozs. grains	Avoirdupois lbs. ozs. grains		Fluid ounces minims		Fluid- ounces and fractions
15432.4	32 72.4	2 3 119.9	1000	33 391.1		33.815
15360.0	32 ...	2 3 47.5	995.311	33 314.9		33.656
15060.5	31 180.5	2 2 185.5	975.906	33		33
15046.5	31 166.5	2 2 171.5	975	32 465.3		32.969
14880.0	31 ...	2 2 5.0	964.208	32 290.1		32.604
14660.7	30 260.7	2 1 223.2	950	32 59.5		32.124
14604.1	30 204.1	2 1 166.6	946.333	32		32
14400.0	30 ...	2 .. 400.0	933.104	31 265.2		31.553
14274.9	29 354.9	2 .. 274.9	925	31 133.7		31.279
14147.8	29 227.8	2 .. 147.8	916.760	31		31
14000.0	29 80.0	2	907.185	30 324.6		30.676
13920.0	29 ...	1 15 357.5	902.001	30 240.4		30.501
13889.1	28 449.1	1 15 326.6	900	30 207.9		30.433
13691.4	28 251.4	1 15 128.9	887.187	30		30
13562.5	28 122.5	1 15	878.835	29 344.4		29.718
13503.3	28 63.3	1 14 378.3	875	29 282.2		29.588
13440.0	28 ...	1 14 315.0	870.897	29 215.6		29.449
13235.0	27 275.0	1 14 110.0	857.614	29		29
13125.0	27 165.0	1 14	850.486	28 364.3		28.759
13117.5	27 157.5	1 13 430.0	850	28 356.4		28.742
12960.0	27 ...	1 13 272.5	839.794	28 190.8		28.397
12778.6	26 298.6	1 13 91.1	828.041	28		28
12731.7	26 251.7	1 13 44.2	825	27 430.6		27.897
12687.5	26 207.5	1 13	822.136	27 384.1		27.800
12480.0	26 ...	1 12 230.0	808.690	27 165.9		27.346
12345.9	25 345.9	1 12 95.9	800	27 24.9		27.052
12322.3	25 322.3	1 12 72.3	798.469	27		27
12250.0	25 250.0	1 12	793.787	26 404.0		26.842
12000.0	25 ...	1 11 187.5	777.587	26 141.1		26.294
11960.1	24 440.1	1 11 147.6	775	26 99.1		26.206
11865.9	24 345.9	1 11 53.4	768.896	26		26
11812.5	24 292.5	1 11	765.437	25 423.8		25.883
11574.3	24 54.3	1 10 199.3	750	25 173.3		25.361
11520.0	24 ...	1 10 145.0	746.484	25 116.2		25.242
11409.5	23 369.5	1 10 34.5	739.323	25		25
11375.0	23 335.0	1 10	737.088	24 443.7		24.924
11188.5	23 148.5	1 9 251.0	725	24 247.5		24.516
11040.0	23 ...	1 9 102.5	715.380	24 91.4		24.190
10953.1	22 393.1	1 9 15.6	709.750	24		24
10937.5	22 377.5	1 9	708.738	23 463.6		23.966

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—Continued

Weights				Metric Weight and Measure Gm. or cc.*	Measures		
Grains	Apothecaries ozs. grains	Avoirdupois lbs. ozs. grains			Fluid ounces minims		Fluid- ounces and fractions
10802.6	22 242.6	1 8	302.6	700	23 321.7	23.670	
10560.0	22 ...	1 8	60.0	684.277	23 66.5	23.139	
10500.0	21 420.0	1 8	....	680.389	23 3.4	23.007	
10496.7	21 416.7	1 7	434.2	680.177	23	23	
10416.8	21 336.8	1 7	354.3	675	22 396.0	22.825	
10080.0	21 ...	1 7	17.5	653.173	22 41.7	22.087	
10062.5	20 462.5	1 7	....	652.039	22 23.3	22.049	
10040.4	20 440.4	1 6	415.4	650.604	22	22	
10031.0	20 431.0	1 6	406.0	650	21 470.2	21.980	
9645.2	20 45.2	1 6	20.2	625	21 64.4	21.134	
9625.0	20 25.0	1 6	....	623.690	21 43.2	21.090	
9600.0	20 ...	1 5	412.5	622.070	21 16.8	21.035	
9584.0	19 464.0	1 5	396.5	621.031	21	21	
9259.4	19 139.4	1 5	71.9	600	20 138.6	20.289	
9187.5	19 67.5	1 5	....	595.340	20 63.0	20.131	
9127.6	19 7.6	1 4	377.6	591.458	20	20	
9120.0	19 ...	1 4	370.0	590.966	19 472.0	19.983	
8873.6	18 233.6	1 4	123.6	575	19 212.9	19.444	
8750.0	18 110.0	1 4	....	566.991	19 82.8	19.173	
8671.2	18 31.2	1 3	358.7	561.885	19	19	
8640.0	18 ...	1 3	327.5	559.863	18 447.2	18.932	
8487.8	17 327.8	1 3	175.3	550	18 287.1	18.598	
8312.5	17 152.5	1 3	....	538.641	18 102.7	18.214	
8214.8	17 54.8	1 2	339.8	532.312	18	18	
8160.0	17 ...	1 2	285.0	528.759	17 422.3	17.880	
8102.0	16 422.0	1 2	227.0	525	17 361.3	17.753	
7875.0	16 195.0	1 2	....	510.291	17 122.5	17.255	
7758.5	16 78.5	1 1	321.0	502.739	17	17	
7716.2	16 36.2	1 1	278.7	500	16 435.6	16.907	
7680.0	16 ...	1 1	242.5	497.656	16 397.5	16.828	
7437.5	15 237.5	1 1	....	481.942	16 142.4	16.297	
7330.4	15 130.4	1 ..	330.4	475	16 29.8	16.062	
7302.1	15 102.1	1 ..	302.1	473.167	16	16	
7200.0	15 ...	1 ..	200.0	466.552	15 372.6	15.776	
7000.0	14 280.0	1 ..	....	453.592	15 162.3	15.338	
6944.6	14 224.6	.. 15	382.1	450	15 104.0	15.217	
6845.7	14 125.7	.. 15	283.2	443.594	15	15	
6720.0	14 ...	.. 15	157.5	435.449	14 347.8	14.725	
6562.5	13 322.5	.. 15	....	425.243	14 182.2	14.379	
6558.8	13 318.8	.. 14	433.8	425	14 178.2	14.371	
6389.3	13 149.3	.. 14	264.3	414.021	14	14	
6240.0	13 ...	.. 14	115.0	404.345	13 322.9	13.673	

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—*Continued*

Weights				Metric Weight and Measure Gm. or cc.*	Measures		
Grains	Apothecaries	Avoirdupois			Fluid		Fluid- ounces and fractions
	ozs. grains	lbs.	ozs. grains		ounces	minims	
6172.9	12 412.9	..	14 47.9	400	13 252.4	13.526	
6125.0	12 365.0	..	14	396.893	13 202.0	13.421	
5932.9	12 172.9	..	13 245.4	384.448	13	13	
5787.1	12 27.1	..	13 99.6	375	12 326.6	12.681	
5760.0	12	..	13 72.5	373.242	12 298.1	12.621	
5687.5	11 407.5	..	13	368.544	12 221.9	12.462	
5476.6	11 196.6	..	12 226.6	354.875	12	12	
5401.3	11 121.3	..	12 151.3	350	11 400.8	11.835	
5280.0	11	..	12 30.0	342.138	11 273.3	11.569	
5250.0	10 450.0	..	12	340.194	11 241.7	11.504	
5020.2	10 220.2	..	11 207.7	325.302	11	11	
5015.5	10 215.5	..	11 203.0	325	10 475.1	10.990	
4812.5	10 12.5	..	11	311.845	10 261.6	10.545	
4800.0	10 ...	..	10 425.0	311.035	10 248.4	10.518	
4629.7	9 309.7	..	10 254.7	300	10 69.3	10.144	
4563.8	9 243.8	..	10 188.8	295.729	10	10	
4375.0	9 55.0	..	10	283.495	9 281.4	9.586	
4320.0	9	..	9 382.5	279.931	9 223.6	9.466	
4244.0	8 403.9	..	9 306.4	275	9 143.5	9.299	
4107.4	8 267.4	..	9 169.9	266.156	9	9	
3937.5	8 97.5	..	9	255.146	8 301.3	8.628	
3858.1	8 18.1	..	8 358.1	250	8 217.8	8.454	
3840.0	8	..	8 340.0	248.828	8 198.7	8.414	
3651.0	7 291.0	..	8 151.0	236.583	8	8	
3500.0	7 140.0	..	8	226.796	7 321.1	7.669	
3472.3	7 112.3	..	7 409.8	225	7 292.0	7.608	
3360.0	7	..	7 297.5	217.724	7 173.9	7.362	
3194.7	6 314.7	..	7 132.2	207.010	7	7	
3086.5	6 206.5	..	7 24.0	200	6 366.2	6.763	
3062.5	6 182.5	..	7	198.447	6 341.0	6.710	
2880.0	6	..	6 255.0	186.621	6 149.0	6.311	
2738.3	5 338.3	..	6 113.3	177.437	6	6	
2700.7	5 300.7	..	6 75.7	175	5 440.4	5.918	
2625.0	5 225.0	..	6	170.097	5 360.9	5.752	
2400.0	5	..	5 212.5	155.517	5 124.2	5.259	
2314.9	4 394.9	..	5 127.4	150	5 34.7	5.072	
2281.9	4 361.9	..	5 94.4	147.865	5	5	
2187.5	4 267.5	..	5	141.748	4 380.7	4.793	
1929.0	4 9.0	..	4 179.0	125	4 108.9	4.227	
1920.0	4	..	4 170.0	124.414	4 99.4	4.207	
1825.5	3 385.5	..	4 75.5	118.292	4	4	
1750.0	3 310.0	..	4	113.398	3 400.6	3.835	

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—*Continued*

Weights				Metric Weight and Measure Gm. or cc.*	Measures	
Grains	Apothecaries ozs. grains	Avoirdupois lbs. ozs. grains			Fluid ounces minims	Fluid- ounces and fractions
1543.2	3 103.2	..	3 230.7	100	3 183.1	3.381
1440.0	3 ...	..	3 127.5	93.310	3 74.5	3.155
1388.9	2 428.9	..	3 76.4	90	3 20.8	3.043
1369.1	2 409.1	..	3 56.6	88.719	3	3
1312.5	2 352.5	..	3	85.049	2 420.4	2.876
1234.6	2 274.6	..	2 359.6	80	2 338.5	2.705
1157.4	2 197.4	..	2 282.4	75	2 257.3	2.536
1080.3	2 120.3	..	2 205.3	70	2 176.2	2.367
960.0	2 ...	..	2 85.0	62.207	2 49.7	2.104
925.9	1 445.9	..	2 50.9	60	2 13.9	2.029
912.8	1 432.8	..	2 37.8	59.146	2	2
875.0	1 395.0	..	2	56.699	1 440.3	1.917
771.6	1 291.6	..	1 334.1	50	1 331.5	1.691
617.3	1 137.3	..	1 179.8	40	1 169.2	1.353
480.0	1 ...	..	1 42.5	31.1035	1 24.9	1.052
463.0	.. ...	..	1 25.5	30	1 6.9	1.014
456.380	.. ...	..	1 18.88	29.5729	1	1
437.5	.. ...	..	1	28.350	.. 460.15	0.959
385.8	.. ...	..	.. ....	25	.. 405.78	0.845
308.6	.. ...	..	.. ....	20	.. 324.62	0.676
154.3	.. ...	..	.. ....	10	.. 162.31	0.338
15.4324	.. ...	..	.. ....	1	.. 16.23	0.0338
1	.. ...	..	.. ....	0.06480	.. 1.0517	0.0022
0.9508	.. ...	..	.. ....	0.06161	.. 1	0.0021

* NOTE—By the “cc.” in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—Continued

From 480 grains down

Grains	Metric Weight and Measure Gm. or cc.*	Minims (of Water at 4° C.)	Grains	Metric Weight and Measure Gm. or cc.*	Minims (of Water at 4° C.)
480 [1 3]	31.103	504.8	240 [4 3]	15.552	252.4
478.4	31	503.2	231.5	15	243.5
475.4	30.805	500	228.2	14.786	240.0
463.0	30	486.9	218.75 [1/2 av. oz.]	14.175	230.1
456.4	29.573	480 [1 f 3]	216.1	14	227.2
450	29.160	473.3	210	13.608	220.9
447.5	29	470.7	200.6	13	211.0
437.5 [1 av. oz.]	28.350	460.2	199.7	12.938	210.0
432.1	28	454.5	185.2	12	194.8
427.9	27.725	450			
420 [7 3]	27.216	441.7	180 [3 3]	11.664	189.3
416.7	27	438.2	171.1	11.090	180.0
401.2	26	422.0	169.8	11	178.5
399.3	25.876	420	154.3	10	162.3
390	25.272	410.2	150	9.720	157.8
385.8	25	405.8	142.6	9.242	150.0
380.3	24.644	400	138.9	9	146.1
370.8	24.028	390	123.5	8	129.8
370.4	24	389.5			
360 [6 3]	23.328	378.6	120 [2 3]	7.776	126.2
354.9	23	373.3	114.1	7.393	120.0
342.3	22.180	360	109.375 [1/4 av. oz.]	7.087	115.0
339.5	22	357.1	108.0	7	113.6
330	21.384	347.1	100	6.480	105.2
324.1	21	340.9	95.1	6.161	100.0
313.8	20.331	330	92.6	6	97.4
308.6	20	324.6	80	5.184	84.1
			77.2	5	81.2
			76.1	4.929	80.0
			61.7	4	64.9
300 [5 3]	19.440	315.5	60 [1 3]	3.888	63.1
293.2	19	308.4	57.0	3.697	60.0
285.2	18.483	300	54.6875 [1/8 av. oz.]	3.544	57.5
277.8	18	292.2	47.5	3.081	50.0
270	17.496	284.0	50	3.240	52.6
262.4	17	275.9	46.3	3	48.7
256.7	16.635	270	42.8	2.772	45.0
246.9	16	259.7	40	2.592	42.1
			38.0	2.464	40.0
			33.3	2.156	35.0
			30.9	2	32.5

* NOTE—By the “cc.” in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—*Continued*

From 30 grains down			Weights from 5 grains down	
Grains	Metric Weight and Measure Gm. or cc.*	Minims (of Water at 4° C.)	Milligrams (mg.)	Grains
30 $1\frac{1}{2}$ 5	1.944	31.55	324 mg.	5
28.52	1.848	30	292 mg.	$4\frac{1}{2}$
23.77	1.540	25	259 mg.	4
20	1.296	21.04	227 mg.	$3\frac{1}{2}$
19.02	1.232	20	194 mg.	3
15.4324	1	16.23	162 mg.	$2\frac{1}{2}$
			130 mg.	2
			97 mg.	$1\frac{1}{2}$
			65 mg.	1
15	0.972	15.78		
14.26	0.924	15		
14	0.907	14.72		
13.31	0.863	14	60.7 mg.	$\frac{15}{16}$
13	0.842	13.67	58.3 mg.	$\frac{9}{10}$
12.36	0.801	13	56.7 mg.	$\frac{7}{8}$
12	0.778	12.63	52.6 mg.	$\frac{13}{16}$
11.41	0.739	12	51.8 mg.	$\frac{4}{5}$
11	0.713	11.57	48.6 mg.	$\frac{3}{4}$
10.46	0.678	11	44.5 mg.	$\frac{11}{16}$
			40.5 mg.	$\frac{5}{8}$
			36.4 mg.	$\frac{9}{16}$
			32.4 mg.	$\frac{1}{2}$
10	0.648	10.52		
9.51	0.616	10		
9	0.583	9.46		
8.56	0.554	9	28.3 mg.	$\frac{7}{16}$
8	0.518	8.41	25.9 mg.	$\frac{2}{5}$
7.72	0.5	8.12	24.3 mg.	$\frac{3}{8}$
7.61	0.493	8	20.2 mg.	$\frac{5}{16}$
7	0.454	7.37	16.2 mg.	$\frac{1}{4}$
6.66	0.431	7	12.1 mg.	$\frac{3}{16}$
6	0.389	6.31	8.1 mg.	$\frac{1}{8}$
5.70	0.370	6	4.0 mg.	$\frac{1}{16}$
			3.2 mg.	$\frac{1}{20}$
			2.6 mg.	$\frac{1}{25}$
5	0.324	5.26	2.2 mg.	$\frac{1}{30}$
4.75	0.308	5	1.8 mg.	$\frac{1}{36}$
4	0.259	4.20	1.6 mg.	$\frac{1}{40}$
3.80	0.246	4	1.3 mg.	$\frac{1}{50}$
3	0.194	3.15	1.1 mg.	$\frac{1}{60}$
2.85	0.185	3	1.0 mg.	$\frac{1}{64}$
2	0.130	2.11	0.6 mg.	$\frac{1}{100}$
1.90	0.123	2	0.5 mg.	$\frac{1}{128}$
1	0.06480	1.0518	0.4 mg.	$\frac{1}{160}$
0.9508	0.06161	1	0.3 mg.	$\frac{1}{210}$
			0.2 mg.	$\frac{1}{320}$
			0.1 mg.	$\frac{1}{640}$

* NOTE—By the “cc.” in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Linear Measures

Metric to English

Centimeters	Inches	Centimeters	Inches	Millimeters	Inches	
					in decimal fractions	in 32ds.
150	59.06	55	21.65	25.4	1	$\frac{32}{32}$
145	57.09	53.3	21	25	0.98	...
140	55.12	50.8	20	24.0	0.94	...
139.7	55	50	19.69	23.8	0.94	$\frac{30}{32}$
135	53.15	48.3	19	23.0	0.91	$\frac{29}{32}$
130	51.18	45.7	18	22.2	0.88	$\frac{28}{32}$
127.0	50	45	17.72	22.0	0.87	...
125	49.21	43.2	17	21.0	0.83	...
120	47.24	40.6	16	20.6	0.81	$\frac{26}{32}$
115	45.28	40	15.75	20	0.79	...
114.3	45	38.1	15	19.1	0.75	$\frac{24}{32}$
110	43.31	35.6	14	19.0	0.75	...
105	41.34	35	13.78	18.0	0.71	...
101.6	40	33.0	13	17.5	0.69	$\frac{22}{32}$
100	39.37	30.5	12	17.0	0.67	...
99.1	39	30	11.81	16.0	0.63	...
96.5	38	27.9	11	15.9	0.62	$\frac{20}{32}$
95	37.40	25.4	10	15	0.59	...
94.0	37	25	9.84	14.3	0.56	$\frac{18}{32}$
91.4	36	22.9	9	14.0	0.55	...
90	35.43	20.3	8	13.0	0.51	...
88.9	35	20	7.87	12.7	0.50	$\frac{16}{32}$
86.4	34	17.8	7	12.0	0.47	...
85	33.46	15.2	6	11.1	0.44	$\frac{14}{32}$
83.8	33	15	5.91	11.0	0.43	...
81.3	32	12.7	5	10	0.39	...
80	31.50	10.2	4	9.5	0.38	$\frac{12}{32}$
78.7	31	10	3.94	9	0.35	...
76.2	30	9	3.54	8.7	0.34	$\frac{11}{32}$
75	29.53	8	3.15	8	0.31	...
73.7	29	7.6	3	7.9	0.31	$\frac{10}{32}$
71.1	28	7	2.76	7.1	0.28	$\frac{9}{32}$
70	27.56	6	2.36	7	0.28	...
68.6	27	5.1	2	6.4	0.25	$\frac{8}{32}$
66.0	26	5	1.97	6	0.24	...
65	25.59	4	1.57	5.6	0.22	$\frac{7}{32}$
63.5	25	3	1.18	5	0.20	...
61.0	24	2.54	1	4.8	0.19	$\frac{6}{32}$
60	23.62	2	0.79	4	0.16	...
58.4	23	1	0.39	3.2	0.12	$\frac{4}{32}$
55.9	22			3	0.12	...
				2.4	0.09	$\frac{3}{32}$
				2	0.08	...
				1.6	0.06	$\frac{2}{32}$
				1	0.04	...
				0.8	0.03	$\frac{1}{32}$
				0.1	0.0039	...

Equivalents of Linear Measures

English to Metric

Feet	Meters	Centimeters	Inches	Milli- meters	Inches in fractions	Inches decimal fractions	Millimeters
25	7.620	762.0	34	863.6	$\frac{15}{16}$	1.000	25.40
24	7.315	731.5	33	838.2	$\frac{15}{16}$	0.9375	23.81
23	7.010	701.0	32	812.8	$\frac{7}{8}$	0.8750	22.22
22	6.706	670.6	31	787.4	$\frac{13}{16}$	0.8125	20.64
21	6.401	640.1	30	762.0	$\frac{6}{8}$	0.7500	19.05
20	6.096	609.6	29	736.6	$\frac{11}{16}$	0.6875	17.46
19	5.791	579.1	28	711.2	$\frac{5}{8}$	0.6250	15.88
18	5.486	548.6	27	685.8	$\frac{9}{16}$	0.5625	14.29
17	5.182	518.2	26	660.4	$\frac{1}{2}$	0.5000	12.70
16	4.877	487.7	25	635.0	$\frac{7}{16}$	0.4375	11.11
15	4.572	457.2	24	609.6	$\frac{3}{8}$	0.3750	9.52
14	4.267	426.7	23	584.2	$\frac{5}{16}$	0.3125	7.94
13	3.962	396.2	22	558.8	$\frac{1}{4}$	0.2500	6.35
12	3.658	365.8	21	533.4	$\frac{3}{16}$	0.1875	4.76
11	3.353	335.3	20	508.0	$\frac{1}{8}$	0.1250	3.18
10	3.048	304.8	19	482.6	$\frac{1}{16}$	0.0625	1.59
9	2.743	274.3	18	457.2	$\frac{1}{32}$	0.03125	0.79
8	2.438	243.8	17	431.8	$\frac{1}{64}$	0.01562	0.40
7	2.134	213.4	16	406.4	$\frac{1}{100}$	0.01000	0.25
6	1.829	182.9	15	381.0	$\frac{1}{200}$	0.00500	0.127
5	1.524	152.4	14	355.6	$\frac{1}{320}$	0.00312	0.08
4	1.219	121.9	13	330.2	$\frac{2}{3}$	0.667	16.93
3	0.9144	91.44	12	304.8	$\frac{1}{5}$	0.333	8.47
2	0.6096	60.96	11	279.4	$\frac{4}{5}$	0.800	20.32
1	0.3048	30.48	10	254.0	$\frac{8}{5}$	0.600	15.24
0.9	0.2743	27.43	9	228.6	$\frac{2}{5}$	0.400	10.16
0.8	0.2438	24.38	8	203.2	$\frac{1}{10}$	0.100	2.54
0.7	0.2134	21.34	7	177.8			
0.6	0.1829	18.29	6	152.4			
0.5	0.1524	15.24	5	127.0			
0.4	0.1219	12.19	4	101.6			
0.3	0.0914	9.144	3	76.2			
0.2	0.0610	6.096	2	50.8			
0.1	0.0305	3.048	1	25.4			

Table for Converting Metric Quantities in Pharmaceutical Processes to Quantities in the Avoirdupois Weights

Table I—Grams to grains, etc. (Product measured)

Grams per liter	Grains per fluidounce		Grains, etc., per pint		Grains, etc., per gallon		
	Ounces avoird.	Grains	Ounces avoird.	Grains	Pounds avoird.	Ounces avoird.	Grains
1	..	0.46	..	7.3	..	..	58.4
2	..	0.91	..	14.6	..	..	116.8
3	..	1.37	..	21.9	..	..	175.3
4	..	1.83	..	29.2	..	..	233.7
5	..	2.28	..	36.5	..	..	292.1
6	..	2.74	..	43.8	..	..	350.5
7	..	3.19	..	51.1	..	..	408.9
8	..	3.65	..	58.4	..	1	30.0
9	..	4.10	..	65.7	..	1	88.0
10	..	4.56	..	73.0	..	1	147.0
20	..	9.13	..	146.0	..	2	293.0
30	..	13.69	..	219.1	..	4	3.0
40	..	18.26	..	292.1	..	5	149.0
50	..	22.82	..	365.1	..	6	296.0
60	..	27.38	1	0.6	..	8	5.0
70	..	31.95	1	73.7	..	9	152.0
80	..	36.51	1	146.7	..	10	299.0
90	..	41.08	1	219.7	..	12	8.0
100	..	45.64	1	292.7	..	13	154.0
200	..	91.28	3	148.0	1	10	309.0
300	..	136.92	5	3.0	2	8	26.0
400	..	182.56	6	296.0	3	5	180.0
500	..	228.20	8	151.0	4	2	334.0
600	..	273.84	10	6.0	5	0	51.0
700	..	319.47	11	299.0	5	13	204.0
800	..	365.11	13	154.0	6	10	360.0
900	..	410.75	15	10.0	7	8	76.0
1000	1	18.89	16	302.0	8	5	231.0

Example: To make 1 gallon.

Camphor and Soap Liniment

Hard Soap.....	60 Gm.	(Table I).....	8 oz.	5	grs.
Camphor.....	45 Gm.	" " {	40 Gm....	5 oz.	149
Oil of Rosemary.....	10 cc.	" " {	5 Gm....		grs. }
Alcohol.....	700 cc.	(Table II).....	1 fl. oz.		134
		" "	5 pts. 9 fl. oz.		min.
					288

Water, sufficient to make 1000 cc.

or 1 gallon

Table for Converting Metric Quantities in Pharmaceutical Processes to Quantities in Apothecaries Measures

Table II—Cc. to minims, etc. (Product measured)

Cc. per liter	Minims per fluidounce	Minims, etc., per pint		Minims, etc., per gallon		
		Fl. oz.	Minims	Pints	Fl. oz.	Minims
1	0.48	..	7.68	..	..	61
2	0.96	..	15.36	..	..	123
3	1.44	..	23.04	..	..	184
4	1.92	..	30.72	..	..	246
5	2.40	..	38.40	..	..	307
6	2.88	..	46.09	..	..	369
7	3.36	..	53.76	..	..	430
8	3.84	..	61.44	..	1	12
9	4.32	..	69.12	..	1	73
10	4.80	..	76.80	..	1	134
20	9.60	..	153.60	..	2	269
30	14.40	..	230.40	..	3	403
40	19.20	..	307.20	..	5	58
50	24.00	..	384.00	..	6	192
60	28.80	..	460.80	..	7	326
70	33.60	1	57.60	..	8	461
80	38.40	1	134.40	..	10	115
90	43.20	1	211.20	..	11	250
100	48.00	1	288.00	..	12	384
200	96.00	3	96.00	1	9	288
300	144.00	4	384.00	2	6	192
400	192.00	6	192.00	3	3	96
500	240.00	8	....	4	..	...
600	288.00	9	288.00	4	12	384
700	336.00	11	96.00	5	9	288
800	384.00	12	384.00	6	6	192
900	432.00	14	192.00	7	3	96
1000	480.00	16	....	8	..	...

Table for Converting Metric Quantities in Pharmaceutical Processes to Quantities in Apothecaries Weights

Table III—Parts per 1000 to grains, etc., per pound avoirdupois

Grams per kilogram	Grains and apothecaries ounces per pound avoirdupois		Grains and ounces avoirdupois per pound avoirdupois	
	Ounces	Grains	Ounces	Grains
1	..	7	..	7.0
2	..	14	..	14.0
3	..	21	..	21.0
4	..	28	..	28.0
5	..	35	..	35.0
6	..	42	..	42.0
7	..	49	..	49.0
8	..	56	..	56.0
9	..	63	..	63.0
10	..	70	..	70.0
20	..	140	..	140.0
30	..	210	..	210.0
40	..	280	..	280.0
50	..	350	..	350.0
60	..	420	..	420.0
70	1	10	1	52.5
80	1	80	1	122.5
90	1	150	1	192.5
100	1	220	1	262.5
200	2	440	3	87.5
300	4	180	4	350.0
400	5	400	6	175.0
500	7	140	8	...
600	8	360	9	262.5
700	10	100	11	87.5
800	11	320	12	350.0
900	13	60	14	175.0
1000	14	280	16	...

Example: To make 1 pound avoirdupois.

Camphor Liniment

Camphor.....	200 Gm.	(Table III).....	3 oz.	87.5 grs.
Cottonseed Oil.....	800 Gm.	" "	12 oz.	350.0 grs.
To make.....	1000 Gm.			or 1 pound avoirdupois

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